

# BAYOU COCODRIE NATIONAL WILDLIFE REFUGE FOREST HABITAT MANAGEMENT PLAN

## **I. Introduction**

The National Wildlife Refuge System Improvement Act of 1997 established, for the first time, a clear legislative mission of wildlife conservation for the National Wildlife Refuge System. Bayou Cocodrie National Wildlife Refuge (BCNWR) is one of more than 540 wildlife refuges in the National Wildlife Refuge System managed by the United States Fish and Wildlife Service. In 1997, activities were initiated to complete Comprehensive Conservation Plans (CCPs) on all refuges. The CCP for BCNWR was completed and approved in 2004.

The Forest Habitat Management Plan (FHMP) for BCNWR focuses on the management of forested habitat on BCNWR for the benefit of wildlife species. BCNWR consists of 10,091 acres of forested habitat, 2,924 acres of reforested agricultural fields, and 153 acres of moist soil impoundments. This FHMP will also serve as the habitat management plan for BCNWR.

### **Scope and Rationale**

The purpose of this plan is to identify the habitat needs of the various wildlife species utilizing the forested habitat of BCNWR. After identifying these needs, management actions will be scheduled and implemented to best meet refuge wildlife objectives. The life span of this FHMP will be for 15 years (2005-2020).

### **Legal Mandates**

The U.S. Congress authorized the establishment of BCNWR on November 16, 1990, through Public Law 101-593 (Section 108, House Report 3338). Management purposes of the refuge are “ (1) conservation and enhancement of wetlands; (2) general wildlife management as a unit of the National Wildlife Refuge System, including management of migratory birds; and (3) fish and wildlife oriented recreational activities.”

In addition to the primary purposes of BCNWR, the following objectives were defined in the 1992 Environmental Assessment and Land Protection Plan prepared by the US Fish and Wildlife Service:

1. Provide wintering habitat for migratory waterfowl
2. Establish habitat for a natural diversity of wildlife species
3. Provide habitat for non-game migratory birds
4. Establish a Research Natural Area

5. Provide opportunities for environmental education, research, interpretation, and other wildlife-dependent recreation

## **Relationship to Other Plans**

This FHMP is a step-down management plan to the Comprehensive Conservation Plan (CCP) for BCNWR. All management objectives follow the management guidelines expressed in the CCP. The CCP was written in accordance with the U.S. Fish and Wildlife Service's commitment to achieve the mandates of the National Wildlife Improvement Act of 1997, the mission of the National Wildlife Refuge System, the North American Waterfowl Management Plan, the Louisiana Black Bear Protection Plan, the Partners-in-Flight Plan, and other plans for the Lower Mississippi Valley.

The CCP for BCNWR calls for additional step-down management plans to be written in the near future. A water management plan, wildlife inventory plan, fire management plan, and an integrated pest management plan will be closely related to the FHMP for BCNWR.

## **II. Background**

BCNWR is located in the Lower Mississippi Alluvial Valley on the Louisiana side of the Mississippi River. The refuge boundary falls entirely within Concordia Parish, Louisiana (See Map 1). Concordia Parish is located in east-central Louisiana with the Mississippi River (east), Tensas River (north), Black River (west), and Red River (south) serving as most of its boundaries. BCNWR is located in the north central portion of Concordia Parish between the communities of Ferriday, Vidalia, and Monterrey. The landscape surrounding BCNWR is highly fragmented with BCNWR being the largest contiguous forest block remaining in the immediate area. Red River and Three Rivers Wildlife Management Areas (WMA) owned by the United States Army Corps of Engineers and Louisiana Department of Wildlife and Fisheries (LDWF) and managed by the LDWF comprise the single largest forest area (approximately 70,000 acres) within Concordia Parish and are located approximately 30 miles south of BCNWR.

There have not been any timber management activities, except reforestation of former agricultural fields, conducted on BCNWR, since the original acquisition from The Nature Conservancy (TNC) in 1992. The most recent information about historical timber management activities on the refuge property is a report from Rigsby Investment Company, Inc., a consulting forestry firm hired by the US Fish and Wildlife Service to conduct an inventory (cruise conducted in August of 1991) of the original 11,192.23 acres purchased from TNC. The historical timber information

in the report given by Rigsby comes from Jerry Talley, a former forester with Fisher Lumber Company, owner of the property prior to TNC. Rigsby's report breaks the refuge into three tracts known as Tract 10 (2,403.5 acres), Tract 10a (4,186.1 acres), and Tract 10b (4,602.6 acres) (these acreages are estimates Rigsby used for his report and not actual acreages according to the property deeds). Since acquisition by the USFWS, the tracts have been renamed as follows: Tract 10 is now called the Wallace Lake Unit, Tract 10a is now called the Brooks Brake Unit, and 10b is now called the Cross Bayou Unit. According to the Property Deeds, 11,255.51 acres were purchased from TNC. Additional properties were purchased by the refuge as follows: 1849.0 acres of farmland known as Esque Plantation were purchased starting in September of 1994 and 64.0 acres of timberland from Angelina Plantation in January of 1996.

The following is a description of the most recent timber harvest history of the three Management Units of BCNWR (See Maps 2, 3 and 4):

**Wallace Lake Unit - 2,467.5 acres**

2,403.5 acres of original purchase from TNC were select-cut from 1986-1988 by Fisher Lumber Company.

64 acres purchased in January of 1996 from Angelina Plantation, timber harvest history unknown.

**Brooks Brake Unit – 4,186.1 acres**

Approximately 2,450 acres of original purchase were select-cut from 1970-1974 by Fisher Lumber Company.

Approximately 1,060 acres of original purchase were select-cut from 1988-1989 by Fisher Lumber Company.

Approximately 676 acres of original purchase has been designated as “Old Growth” and has not been logged since the 1930’s.

**Cross-Bayou Unit – 6,451.6 acres**

Approximately 2,311.3 acres of original purchase were clear-cut in stages from 1979-1985 by Fisher Lumber Company.

Approximately 783.4 acres of original purchase were select-cut in 1964 by Fisher Lumber Company.

Approximately 180 acres of original purchase were select-cut in 1969 by Fisher Lumber Company.

Approximately 1,327.9 acres of original purchase were in farmland and is known as the Tiffie Field.

This field contains the following:

1. Reforestation from 1997-2001 equals 942 acres
2. Moist Soil Management combined with reforestation equals 133 acres
3. Moist Soil Management without reforestation totals 152.9 acres

Approximately 1849.0 acres of farmland, known as Esque Plantation, was purchased in November of 1994. This field has been reforested in stages starting in 1996 and completed in 2002.

According to the final CCP for BCNWR, forest management for the refuge is divided into two objectives:

1. Manage and enhance approximately 3,200 acres of the Brooks Brake Unit (outside of the protected old growth area) to move toward old growth conditions for interior forest breeding songbird populations.
2. Manage, at a minimum, 10,000 acres of existing mid-succession forests in the Wallace Lake and Cross Bayou Units to support migratory songbirds and resident species.

Both forest management objectives are dependent upon an uneven-aged forest with a canopy structure that is diverse in species composition and distribution, as well as variable height, diameter, and age classes. These conditions can be met by utilizing various silvicultural techniques such as single-tree and group-selection, thinning, and patch cuts. A combination of these silvicultural treatments will be used to stratify the canopy layers and diversify the plant communities found on the refuge. Adhering to the entry cycle outlined later in this plan will improve the vertical structure of the refuge's forested area and develop new age classes.

Prior to European settlement, natural disturbances such as rivers changing course, floods, snow and ice storms, droughts, fires, tornados, hurricanes, and biological factors such as animals, Native Americans, insects, and disease were the leading factors in changing the structure and diversity of the forests of the Mississippi Alluvial Valley (MAV) (Dickson 1997). The Mississippi River Levee System, channelization of most major waterways, land clearing for agriculture and houses, urbanization, increased water drainage, draining wetlands for agricultural production, and logging practices have been the main factors in reducing the impact of natural disturbances in the MAV since the beginning of European settlement (Winters, Putnam, and Eldredge 1938, Hamel and Buckner 2001, Hamel and Foti 2001, and various others).

Today, more than 80% of the forested landscape of the MAV has been converted to uses other than forestry. The forested landscape that remains is fragmented into small blocks throughout the MAV. Fragmentation and

development have lessened the overall impact of natural disturbances on the MAV. Natural disturbances only affect a small local area of the forested landscape at any given time. Natural disturbances do not occur at a rate suitable to maintain changes in habitat resulting from natural succession and disturbance that many wildlife species depend on for disturbance related habitat niches.

Active forest management is needed to maintain the various habitat niches that different wildlife species require. Forest management using silvicultural methods that allow for the development of a diverse plant community is the best tool we have for developing and maintaining a variety of habitat conditions within a given area of forested landscape. The variation in growth characteristics of the 30 or more tree species found on the refuge will naturally develop a stratified forest canopy, but forest management is needed to offset changes in species composition and canopy structure caused by past forest management, changes in hydrology, and the introduction of non native plant species. The silvicultural method used in any given area whether it is an even-aged or an uneven-aged harvest method, for the most part, is not as important as establishing and maintaining diversity in tree species, heights, diameters, distribution, and vigor. Historically, natural disturbances led to the formation of such conditions throughout the MAV to varying degrees.

More than 30 tree species occur on the refuge. All the tree species found on the refuge are important to wildlife for various reasons such as food, shelter, cover, and perches. Each species also has different growth rates, sunlight needs and tolerances, moisture needs and tolerances, soil requirements, and seedbed requirements. Forest management practices will strive to meet the varying needs of all of these species.

Closed canopy conditions with a dominant overstory currently comprise most of the forested habitat on the refuge. These conditions are not favorable for many neotropical bird species and other wildlife such as the threatened Louisiana black bear. These closed canopy conditions limit sunlight reaching the forest floor, thus preventing the development of midstory and understory vegetation that is important to many wildlife species.

The only exceptions to these conditions are the reforestation areas and the Old Growth Area located in the Brooks Brake Unit. The reforestation areas will start demonstrating closed canopy conditions in the next 10 to 20 years and will need silvicultural treatment at that time. The Old Growth Area currently exhibits diversified canopy conditions and will be left for research purposes and to satisfy the habitat needs of various wildlife species that need mature forest conditions.

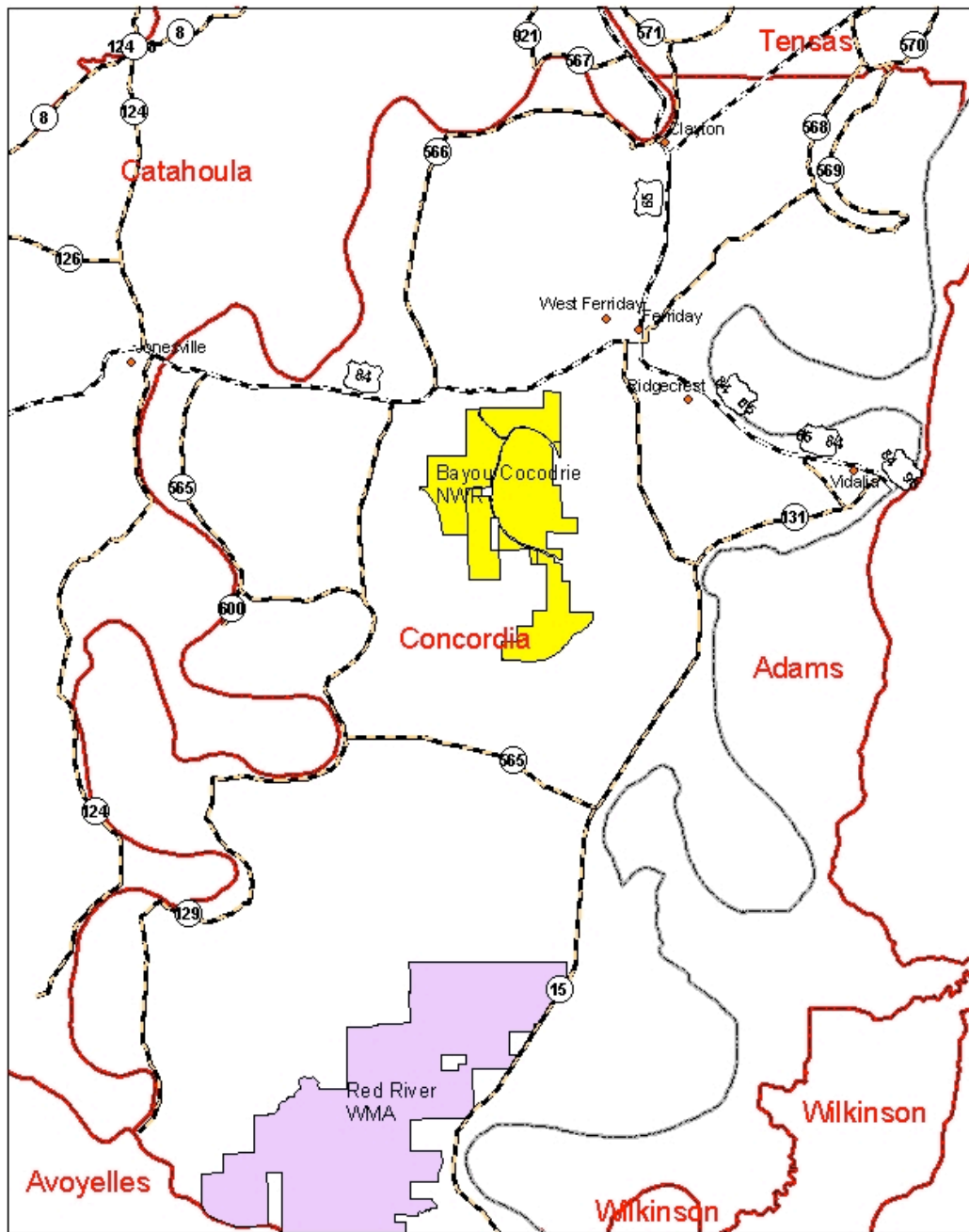
The elimination of historic flooding events through the development of the Mississippi River Levee System and other levee systems within Concordia

Parish have greatly changed habitat conditions found on BCNWR. Removing flood events and limiting flood duration has changed plant species composition and distribution throughout the BCNWR. Many plant species that are intolerant of flooding have increased in number and have spread to lower elevations while flood dependant species have more competition and less favorable conditions in which to develop.

The clearing of millions of acres within the Mississippi River Alluvial Valley for agricultural crop production has also changed habitat conditions. The first sites cleared for agricultural purposes were usually the best-drained sites with the most fertile soils and highest elevations in the area. These sites could support a more diversified plant community than sites at lower elevations due to better drainage and shorter flood durations. The forested areas of BCNWR consist mostly of the lower sites that were not as highly prized for agricultural production, thus they were not cleared during the last major land clearing activities of the 1970s. The higher sites favored for agricultural production are limited on BCNWR.

## **Maps**

# LOCATION MAP FOR BCNWR MAP 1

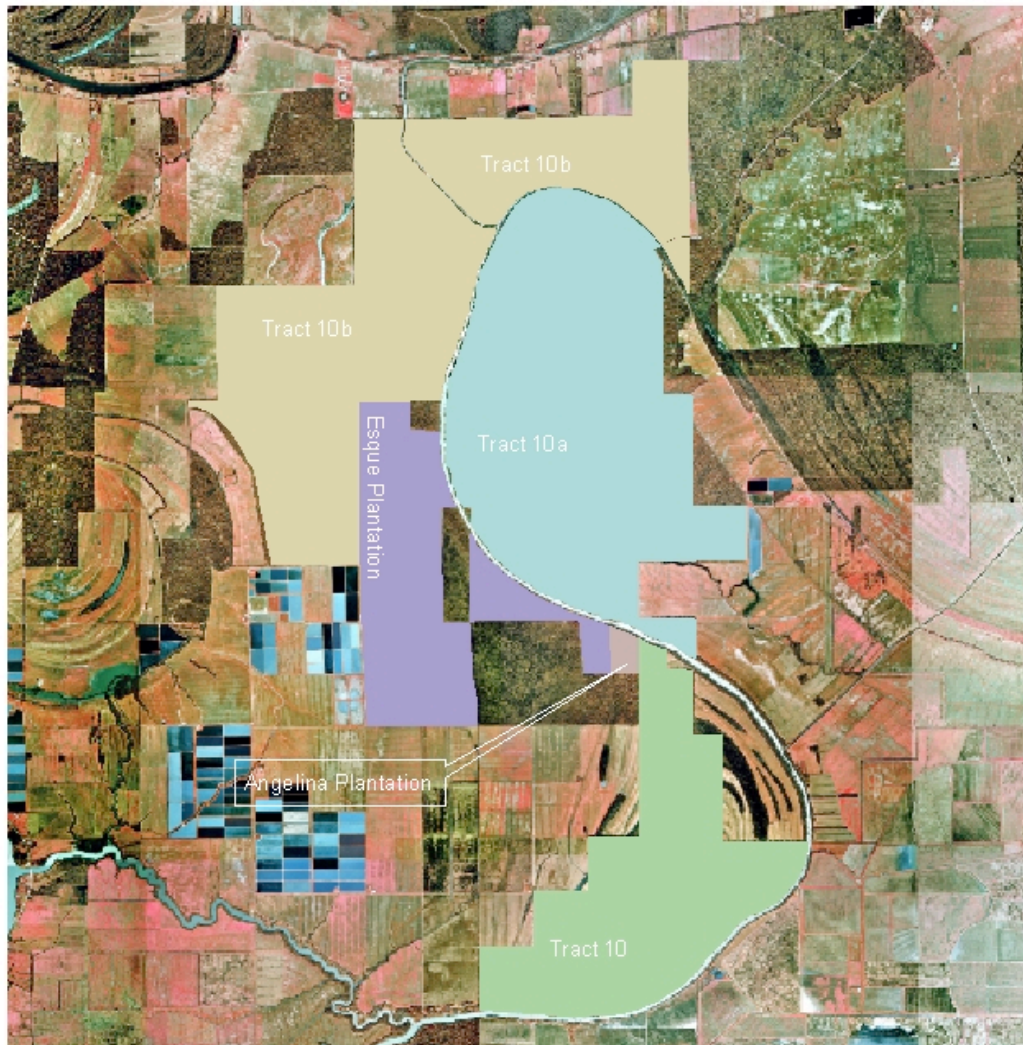


## Legend

- Cities and Towns
- State Highways
- US Highways
- BCNWR Boundary
- State Boundaries
- Louisiana WMAs
- Parish/County Boundaries



# BCNWR ACQUISITIONS MAP 2



## Legend

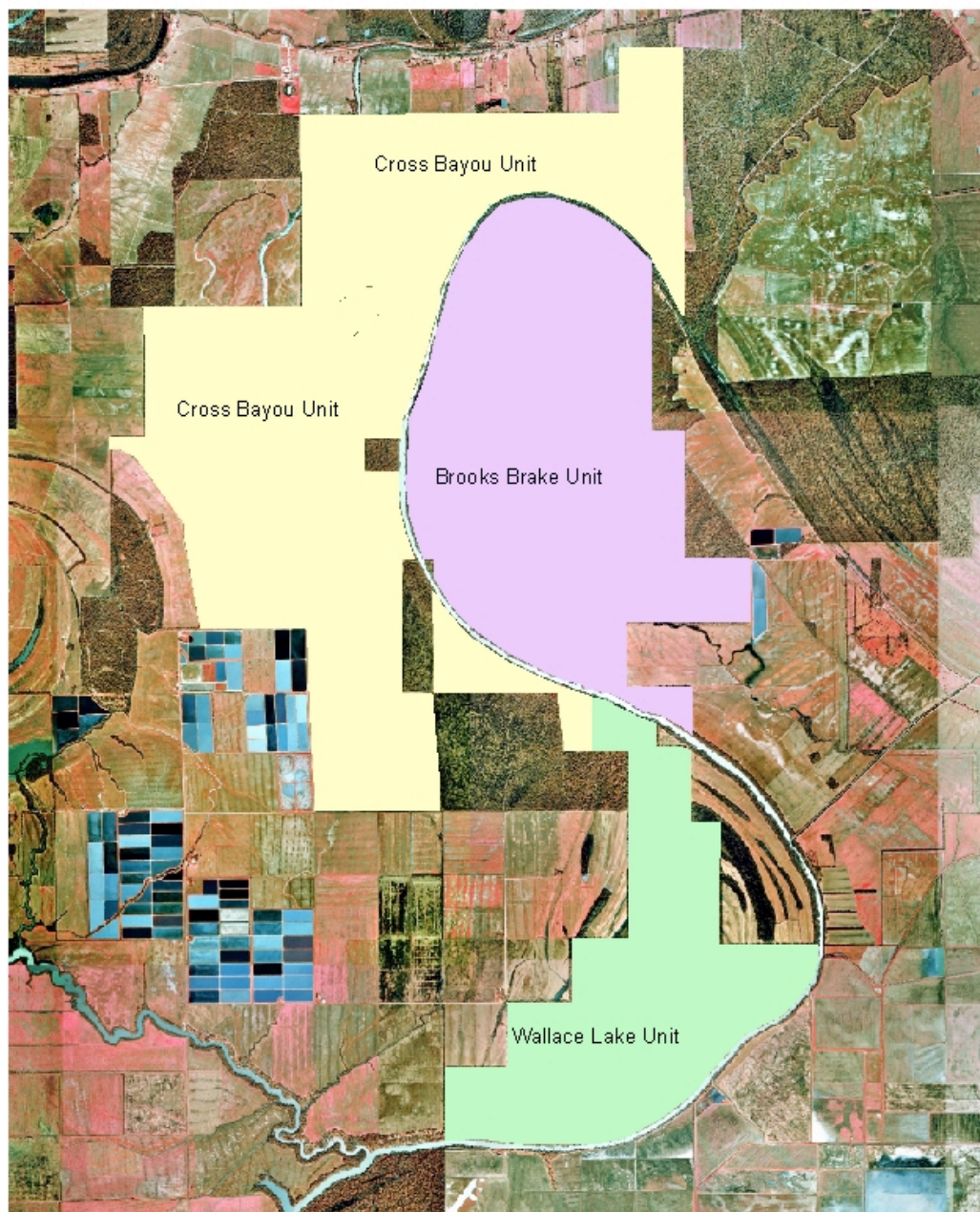
- Angelina Plantation
- Esque Plantation
- Tract 10
- Tract 10a
- Tract 10b

1:90,000





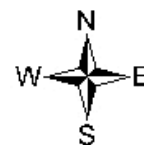
# BCNWR MANAGEMENT UNITS MAP 3



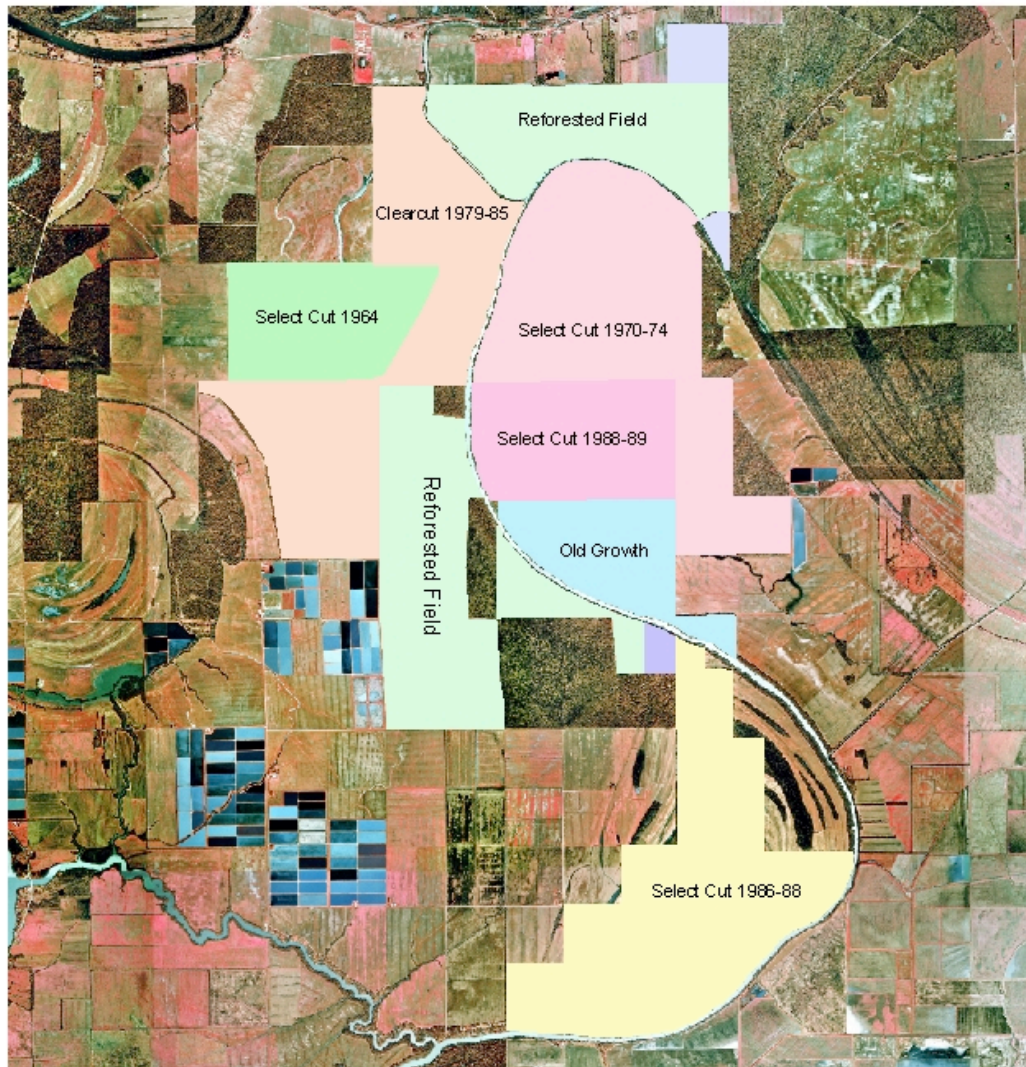
## Legend

- Brooks Brake Unit
- Cross Bayou Unit
- Wallace Lake Unit

1:75,000



# BCNWR HISTORY OF TIMBER HARVEST MAP 4



## Legend

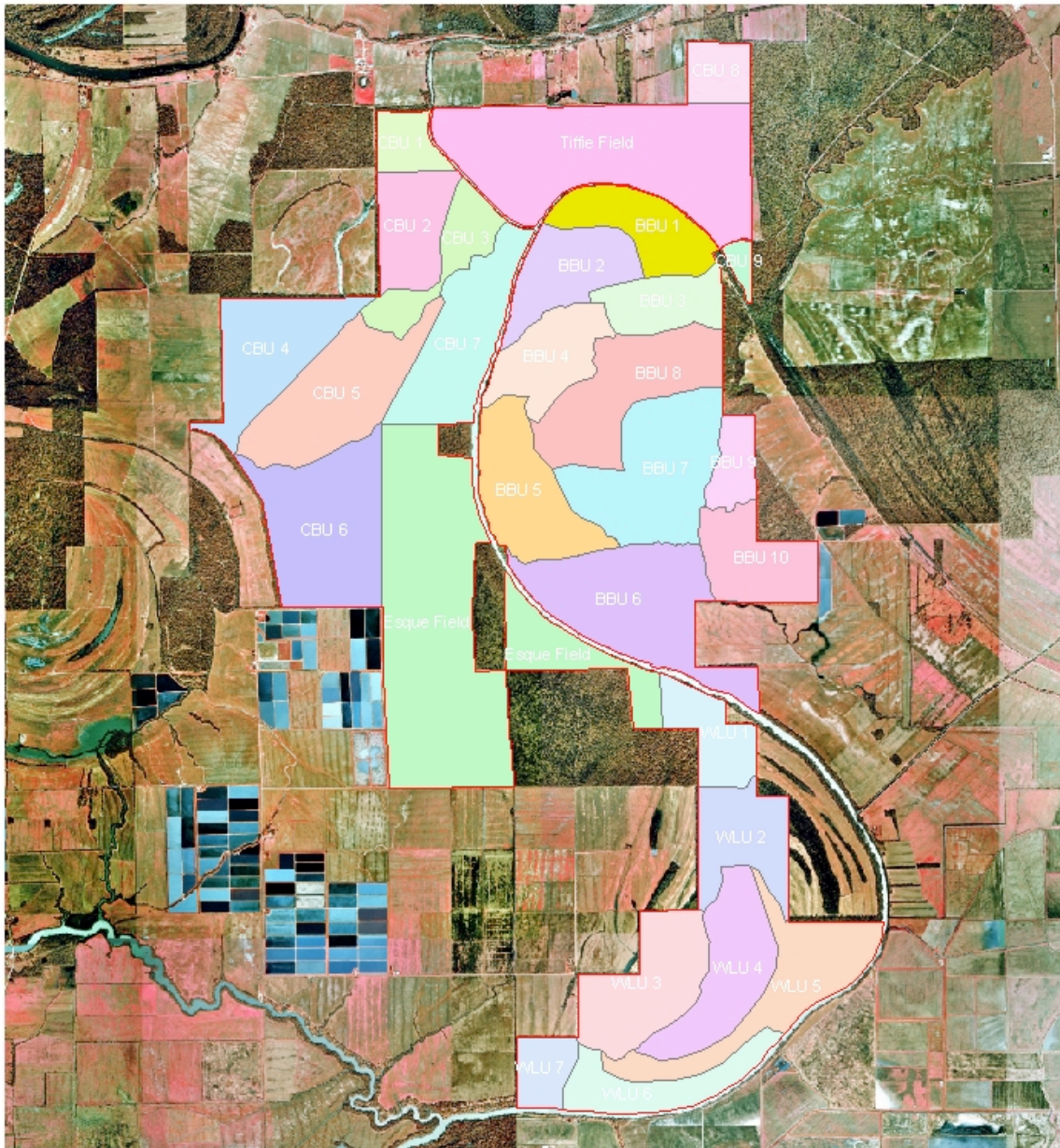
Acquired Jan. 1996	Select Cut 1969
Clearcut 1979-85	Select Cut 1970-74
Old Growth	Select Cut 1986-88
Reforested Field	Select Cut 1988-89
Select Cut 1964	

1:85,000





# BCNWR COMPARTMENT MAP MAP 5



## Legend

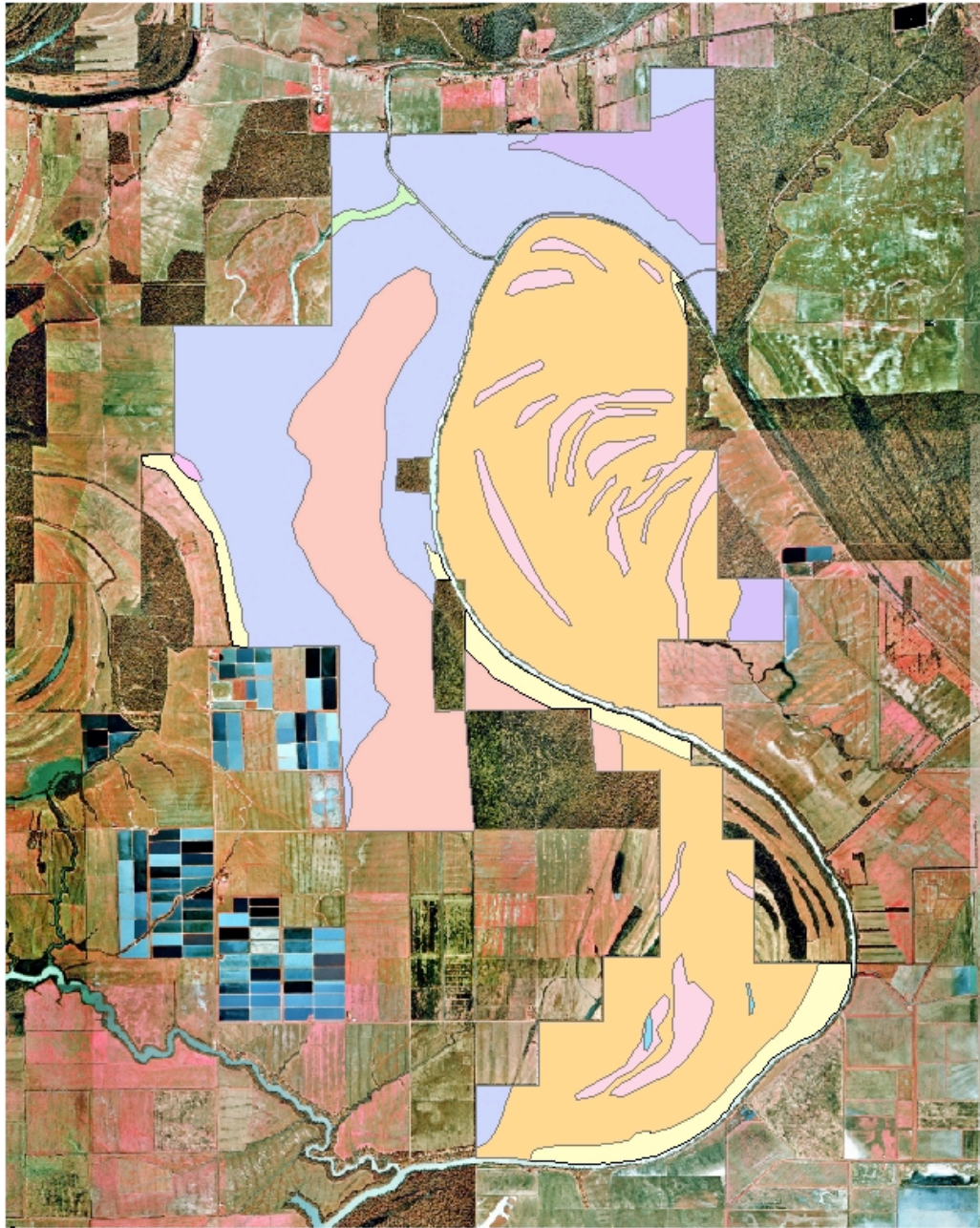
BCNWR Boundary	Brooks Brake 5	Cross Bayou 2	Cross Bayou 8	Wallace Lake 3
Brooks Brake 1	Brooks Brake 6	Cross Bayou 3	Cross Bayou 9	Wallace Lake 4
Brooks Brake 10	Brooks Brake 7	Cross Bayou 4	Esque Field	Wallace Lake 5
Brooks Brake 2	Brooks Brake 8	Cross Bayou 5	Tiffie Field	Wallace Lake 6
Brooks Brake 3	Brooks Brake 9	Cross Bayou 6	Wallace Lake 1	Wallace Lake 7
Brooks Brake 4	Cross Bayou 1	Cross Bayou 7	Wallace Lake 2	

1:75,000





# BCNWR SOILS MAP MAP 6



## Legend

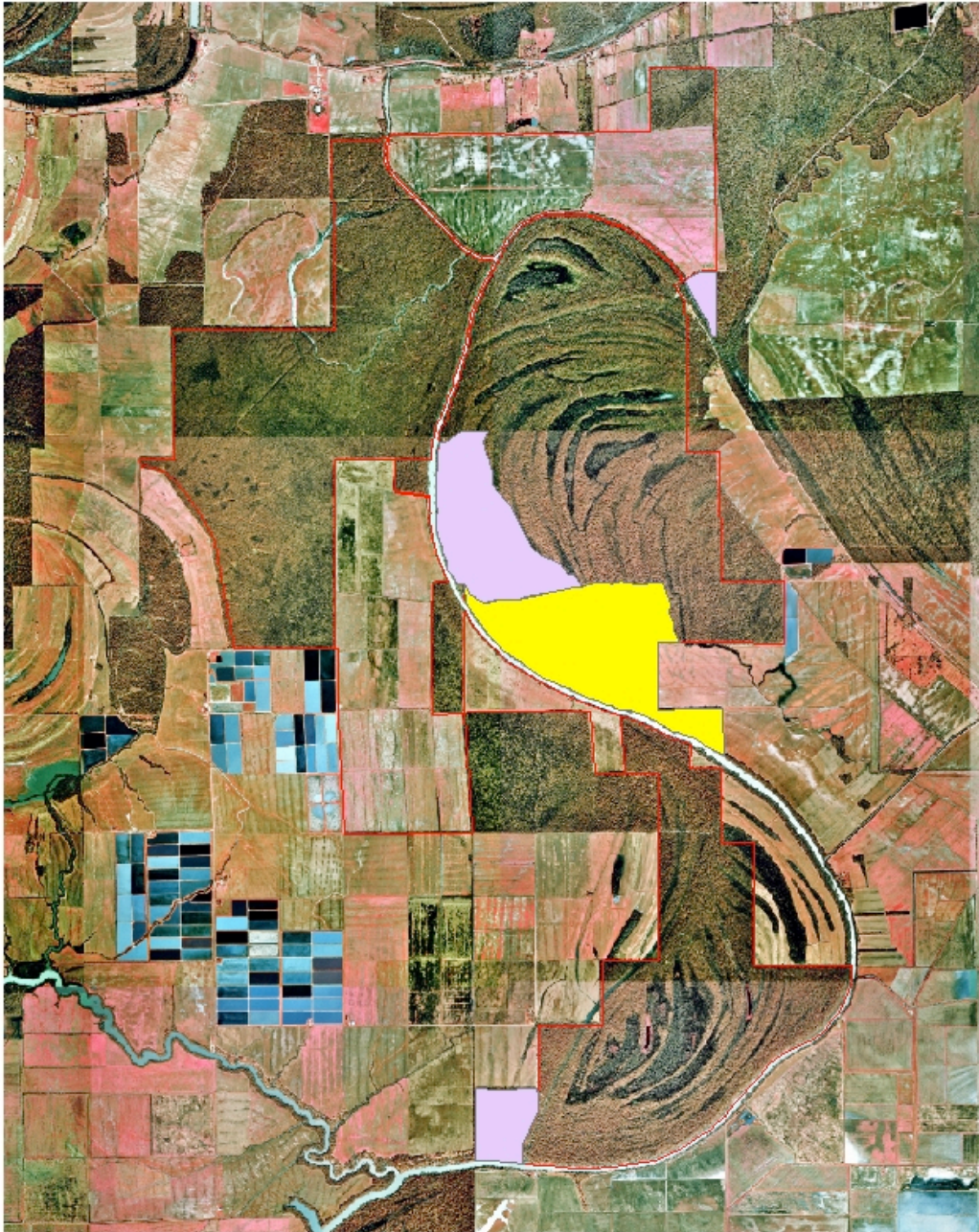
Alligator Clay	Little Wallace Lake	Tensas Silty Clay
Alligator Clay, oc. flooded	Sharkey Clay, freq. flooded	Wallace Lake
Dundee Loam	Sharkey Clay, oc. flooded	
Fausse Clay	Tensas Alligator Complex,	

1:75,000








# BCNWR PROTECTED AREAS MAP 7



## Legend

-  No Cut Zones
-  Old Growth Area
-  BCNWR Boundary

1:75,000



### III. Resources of Concern

The Refuge Objectives state that the refuge should be managed for the benefit of all wildlife species; there are no species to be disfavored, except nonnative and/or invasive species. Creating and maintaining a forested landscape that is diverse in species composition, vertical structure, and stages of succession will best meet these objectives for the greatest number of wildlife species at any given time on the Refuge.

In situations where forest management practices may conflict with the habitat needs among wildlife species, the forest management practices will follow the priority order listed in the following groups.

#### Threatened and Endangered Species

Currently, there are three federally listed species found on or in the vicinity of the Refuge and two species that are listed as Species of Management Concern for the US Fish and Wildlife Service Southeast Region. These species are:

1. Louisiana black bear – *Ursus americanus luteolus* - Threatened
2. Bald eagle – *Haliaeetus leucocephalus* - Threatened
3. Interior least tern – *Sterna antillarum* - Endangered
4. Rafinesque's big-eared bat – *Corynorhinus rafinesquii* – Species of concern
5. Southeastern myotis – *Myotis austroriparius* – Species of concern

Although the Louisiana black bear has been sighted on the refuge on numerous occasions, it is not a confirmed resident of the refuge. Restoration efforts by the Black Bear Conservation Committee, U.S. Fish and Wildlife Service, Louisiana Department of Wildlife and Fisheries, and Louisiana State University have included relocating black bears in the vicinity of the refuge. Forest habitat management prescriptions will follow forest management guidelines and recommendations found in the Black Bear Management Handbook (Black Bear Conservation Committee, 1992) and Louisiana Black Bear Recovery Plan (US Fish and Wildlife Service, 1995). These practices include uneven-aged management practices such as single-tree and group selection along with patch clearcuts. Incorporating these silvicultural practices into the FHMP will maintain plant species diversity within the forest and increase foraging opportunities, ground cover, and downed woody debris for dens. Large hollow trees with cavities or potential cavities large enough for a bear (>36 inches in dbh.), especially tupelo and baldcypress, will be left for den trees.

The bald eagle has been observed on the refuge and nests have been found on adjoining properties. In conjunction with timber cruising and timber marking, visual surveys will be conducted to locate eagle nests that may exist within

each compartment. If any eagle nests are found, the guidelines set forth in “Habitat Management Guidelines for the Bald Eagle in the Southeast Region”, US Fish and Wildlife Service, January 1987, will be followed.

The Interior least tern utilizes sandbars along the Mississippi River, thus should not be affected by forest management practices on Bayou Cocodrie NWR.

Rafinesque’s big-eared bats and Southeastern myotis are listed as Species of Management Concern and have been observed on the refuge (personal observation Mike Esters and Amanda Shahan, 2001, and Irena Tomankova, 2004). Forest management activities will leave large diameter hollow trees (especially tupelo and baldcypress) scattered throughout treatment areas, recruit and retain snags, and maintain a diversified forest structure in an effort to provide suitable roost and maternity sites for these bat species.

The eastern cougar (*Felis concolor*) and red wolf (*Canis niger*) were former residents of the area, but neither has been documented in the last 40 years.

### **Waterfowl**

Bayou Cocodrie NWR is located within the Mississippi flyway, and serves as a wintering ground for many species of waterfowl including: mallards, gadwalls, wood ducks, green-winged teal, and hooded mergansers.

Waterfowl management has focused upon providing adequate feeding and resting habitat. Forest management for waterfowl habitat will focus on:

1. Leaving cavity trees within forested areas for nesting wood ducks and hooded mergansers
2. Opening the forest canopy on sites subject to periodic flooding to stimulate growth of moist soil plants. This will also increase the production of macro organisms and microorganisms that are important food sources for waterfowl and other wildlife species.
3. Maintain a diversity of tree species, especially hard mast producers such as oak and pecan, for a consistent food source.

### **Other Migratory Birds**

Avian species are extremely important wildlife resources identified on the Refuge with more than 186 species recorded within the Refuge boundary (unpublished data, Ouchley). The forest management plan will follow the list of priority bird species associated with the refuge bottomland hardwood forest

given in The BCNWR CCP (Figure 11, page 39) to determine greatest species needs.

The Refuge will conduct point counts to monitor any population changes associated with forest management activities. Information from previous research studies on bird populations conducted within the Refuge boundaries and data collected from point counts in areas prior to forest management activities, will serve as baseline data for population trends within the Refuge.

### **Resident Species**

One of the refuge objectives is to manage for a natural diversity of wildlife. Resident wildlife species currently found on the refuge include game animals such as white-tailed deer, wild turkeys, raccoons, fox squirrels, gray squirrels, and swamp rabbits as well as numerous non-game mammals, reptiles, and amphibians. Forest management activities outlined in this FHMP will increase early successional plant production, downed woody debris, mast production and insect foraging opportunities, thus benefiting a wide range of wildlife species found on the refuge.

Maintaining healthy resident wildlife populations is important to meet the refuge system's wildlife first mission as well as to provide compatible wildlife-dependent recreation for the public such as hunting, fishing, wildlife photography, wildlife observation, environmental education, and interpretation. Forest management practices that focus on the habitat needs of any given species will usually result in helping many other species at the same time. Managing for a healthy, diverse forest habitat will better meet the needs of all wildlife that is dependant on forested habitats.

### **Fish and Aquatic Vertebrates**

Forest management practices outlined in this FHMP for BCNWR should not have any negative impacts on the fisheries of Bayou Cocodrie and its tributaries adjoining BCNWR. Maintaining 200-foot buffer strips along major waterways and permanent bodies of water together with limiting logging operations to the summer and early fall months will reduce the risk of soil disturbance which could affect local fisheries.

### **Trees and Shrubs To Be Favored**

Below is a list of approximately 30 tree species found on BCNWR:

Common Name	Genus and Species	Shade Tolerance
sweetgum	<i>Liquidambar styraciflua</i>	Intolerant
American elm	<i>Ulmus americana</i>	Intermediate
cedar elm	<i>Ulmus crassifolia</i>	Intermediate



nuttall oak	<i>Quercus texana</i>	Intolerant
water oak	<i>Quercus nigra</i>	Intolerant
willow oak	<i>Quercus phellos</i>	Intolerant
cherrybark oak	<i>Quercus pagodifolia</i>	Intolerant
overcup oak	<i>Quercus lyrata</i>	Intermediate
green ash	<i>Fraxinus pennsylvanica</i>	Tolerant
sweet pecan	<i>Carya illinoensis</i>	Intolerant
bitter pecan	<i>Carya lecontei</i>	Intermediate
sugarberry	<i>Celtis laevigata</i>	Tolerant
red maple	<i>Acer rubrum</i>	Tolerant
boxelder	<i>Acer negundo</i>	Moderately Tolerant
black willow	<i>Salix nigra</i>	Very Intolerant
eastern cottonwood	<i>Populus deltoides</i>	Very Intolerant
baldcypress	<i>Taxodium distichum</i>	Intermediate
sycamore	<i>Platanus occidentalis</i>	Intermediate
persimmon	<i>Diospyros virginiana</i>	Very Tolerant
blackgum	<i>Nyssa sylvatica</i>	Intolerant
water tupelo	<i>Nyssa aquatica</i>	Intolerant
sassafras	<i>Sassafras albidum</i>	Intolerant
black locust	<i>Robinia pseudoacacia</i>	Very Intolerant
honeylocust	<i>Gleditsia triacanthos</i>	Intolerant
winged elm	<i>Ulmus alata</i>	Tolerant
red mulberry	<i>Morus rubra</i>	Tolerant
roughleaf dogwood	<i>Cornus drummondii</i>	Very Tolerant
water elm	<i>Planera aquatica</i>	Tolerant
Hercules-club	<i>Zanthoxylum clava- herculis</i>	Intolerant
pumpkin ash	<i>Fraxinus profunda</i>	Intolerant
eastern redbud	<i>Cercis canadensis</i>	Tolerant

(Tree species information cited from U.S.D.A., Forest Service, Agricultural Handbook 654, December 1990, Silvics Manual Volumes 1+2)

Each of these species has individual habitat needs and requirements such as soil preferences, shade tolerances, seedbed conditions, water tolerances, etc. Developing and maintaining a diverse population of tree species will enhance our ability to provide a variety of habitat niches for wildlife. Variations in growth rates, crown development, fruit production, flowering, and longevity for tree species, help to maintain a multi-layered forest canopy.

Large baldcypress and tupelo trees with a diameter at breast height (DBH) of 36 inches or greater should be considered as candidate den trees for Louisiana

black bears (*Federal Register Vol. 57, No. 4, page 593*) and other species such as Rafinesque's big-eared bats, thus these trees will not be considered for timber harvest. Black bears have been documented denning in other tree species as well (*U.S. Fish and Wildlife Service, Louisiana Black Bear Recovery Plan, 1995*). Thus, trees  $\geq 30$  inches DBH will be evaluated for their suitability to serve as future den trees. Trees with large diameters are usually dominant or co-dominant canopy trees with well-developed crowns that allow for optimum mast production. These trees are utilized by canopy dwelling neotropical migrant birds as well as other wildlife species for nesting, perching, denning, and food.

Switchcane (*Arundinaria gigantea*) is an important plant species found in the forested habitat of the Refuge. Switchcane provides important habitat for neotropical bird species such as Hooded Warbler, as well as many mammals including black bears (*U.S. Fish and Wildlife Service, Louisiana Black Bear Recovery Plan 1995*). Switchcane is an early successional plant that develops in forest openings and then dies out as the forest canopy is closed by tree development. Thus, when areas of switchcane are found during forest inventories, silvicultural methods will be prescribed to encourage its growth and regeneration.

#### **IV. Habitat Goals and Objectives**

Forest Management Policy Section 6 RM 3.2 of the Refuge Manual states that the policy of the U.S. Fish and Wildlife Service is to manage forests in a manner that best meets the overall objectives of a particular refuge. The objectives of forest management on refuges as stated in Section 6 RM 3.3 of the Refuge Manual are:

1. To provide habitat and protection for those species of plants and animals indigenous to the refuge that are officially listed by the Service and/or State as being threatened or endangered.
2. To provide habitat for waterfowl, other migrant birds, resident species, and fisheries.
3. To provide compatible opportunities for wildlife-oriented recreation, environmental education, and interpretive/demonstration activities.

The Objectives of BCNWR, according to the refuge's Comprehensive Conservation Plan (CCP 2004), include:

1. Providing wintering habitat for migratory waterfowl

2. Establishing habitat for a natural diversity of wildlife
3. Providing habitat for non-game migratory birds (neotropical migrants).
4. Establishing a Research Natural Area in the Old Growth Area of Brooks Brake Unit
5. Providing opportunities for environmental education, research, interpretation, and other wildlife-dependent recreation.

The forested habitat management program on BCNWR will be implemented in accordance with the objectives stated above.

## **V. Habitat Management Strategies**

### **Silvicultural Methods for Meeting Forest Habitat Management Objectives**

A combination of silvicultural methods will be utilized to meet the uneven-aged forest management objectives described in the refuge CCP. The silvicultural methods to be used for forest management prescriptions are:

1. Thinning - Intermediate cuttings that are aimed primarily at controlling the growth of stands by manipulating stand density. The objective of thinning on the refuge will be to open the forest canopy, release trees from competition, improve regeneration, and improve species composition within a stand.
2. Single-Tree Selection - Removal of a single mature individual tree or small clumps of several such trees. Openings created with this method are generally about ¼ acre in size. This is an uneven-aged silvicultural method that will allow for the development of a new age class of trees within the forest structure. This method favors the regeneration and development of plant species with higher shade tolerances.
3. Group-Selection - Removal of trees from a stand in groups to create openings in the forest canopy. These openings are generally about ½ acre in size. The increased size of the openings will encourage the regeneration of more shade intolerant plant species such as sweetgum, red oaks, pecan, green ash, etc.
4. Patchcuts - Patchcuts are small clearcuts that vary in size from 1 to 3 acres. Dependent upon the shape of the patchcuts, forest openings of this size will eliminate the effects of shading throughout most of the opening. This will benefit the regeneration of even the most shade intolerant plant

species. A few cavity trees may be left within each patchcut to provide perches and nest locations for some bird species. Patchcuts will provide small areas of even-aged forest scattered across an uneven-aged forested landscape that will benefit many species that need even-aged stand conditions to regenerate successfully such as sweetgum, red oaks, cottonwood, sycamore, pecan, etc.

### **Forest Management Objectives Divided by Refuge Management Units**

Forest Management objectives vary slightly among management units, but they generally move the entire refuge towards an uneven-aged forest that mimics “Old Growth Forest Conditions”.

#### **Brooks Brake Unit Forest Management Objectives**

The CCP designates that forest management for the Brooks Brake Unit of the refuge should mimic forest conditions found in the Old Growth Forest Area. Currently, the Brooks Brake Unit consists of approximately 3,200 acres of mature even-aged timber stands (not including the 750 acres designated as the Old Growth Forest Area) that supports marginal habitat for priority forest breeding bird species (Bayou Cocodrie NWR CCP).

To improve habitat for forest breeding birds within this unit and mimic forest conditions in the “Old Growth Forest Area”, forest management in the Brooks Brake Unit will utilize a combination of silvicultural methods such as group selection, thinnings, and small patch cuts. By combining these silvicultural methods, the result should be a forest structure that is uneven-aged, has a multi-layered forest canopy, and contains a diversity of plant species. Opening the forest canopy will encourage new plant growth within the treated areas of the forest, especially in the forest midstory, understory, and ground layers; increase soft and hard mast production by releasing remaining plants from competition for sunlight and water; and improve forest health by reducing competition related stress. The forest conditions created as a result of forest management activities will also improve habitat conditions for many wildlife species other than forest breeding birds, such as Louisiana black bear and waterfowl.

#### **Cross Bayou and Wallace Lake Units Forest Management Objectives**

Objectives for Cross Bayou and Wallace Lake Units include thinning and group selection cuts to increase natural diversity and restore forest habitats to uneven-aged stands. The overall goal for forest management on the refuge is to manage the forest to mimic “Old Growth Conditions” throughout the refuge. Because of past forest management practices on these two units, it will require two or more entry cycles for each compartment to reach this goal on these units.

The clear-cut area on the Cross Bayou Unit was harvested from 1979-1985. The resulting forest is even-aged and overstocked. A series of thinnings in combination with single-tree and group selection will be needed to achieve the desired result of an uneven-aged stand.

The remaining 963 acres of the Cross Bayou Unit were selectively logged in 1964 and 1969. The forest condition in these areas is a closed canopy even-aged forest with very little development in the understory and midstory. Forest management in this area will be very similar to the treatments recommended for the Brooks Brake Unit. Forest management for this area of the Cross Bayou Unit will consist of a combination of thinnings with single-tree selection, group selection, and patchcuts. Combining these silvicultural methods will open up the forest canopy, establish stratification of the canopy, convert the forest to an uneven-aged condition, increase mast production potential, and release remaining plants from competition for sunlight, water, and nutrients.

The entire Wallace Lake Unit (2,403 acres) was high-graded from 1987-1989. High-grading refers to the removal of the most valuable trees in a given timber stand for highest economic return. Trees left over from such timber practices are usually the worst specimens of each individual tree species. This type of forest management can have detrimental long-term effects on both timber production and wildlife habitat values. Healthy vigorous trees are needed to provide optimal values for both wildlife habitat and timber production. For this unit, forest management practices will mostly focus on using single-tree, group selection, and patchcuts to improve forest health and vigor, as well as, establish and maintain a diverse forest with vertical stratification in the canopy. Thinnings will be utilized whenever appropriate to meet forest management objectives.

### **Timber Marking Procedures**

Timber marking is simply the means by which individual trees are designated by the forester to be harvested during a commercial timber harvest operation. To determine which trees are designated for removal, the forester will follow sound silvicultural procedures prescribed in the compartment prescription. As the forester determines which trees are to be removed, paint will be applied at breast height and at the base of trees to be removed. These two marks allow for the contractor to distinguish, which trees are designated for removal during logging operations and help the forester identify the stumps of marked trees during administration of the logging contract.

Timber marking is very subjective and varies from one timber marker to another. Though the compartment prescription gives the timber marker guidelines to follow, each individual timber marker has a different opinion on

how to reach the desired results of the compartment prescription. To ensure forest diversity and avoid bias, more than one person should be involved with the timber marking of treatment areas on the refuge.

During the timber marking activities, many factors are considered before selecting a tree for removal. These include species composition of the compartment, tree health and vigor, present regeneration, potential regeneration, canopy structure, number of cavities within the area, habitat value of the tree, mast production, and objectives of the compartment prescription. The compartment prescription designates how much timber volume or basal area to remove during a treatment, but the application of the prescription occurs during timber marking.

### **Mast Production**

Mast is defined as the fruits and seeds of all plants, both woody and herbaceous, used as food by animals (Research and Management Techniques 1996). Mast is high in food energy, especially carbohydrates and fats (Goodrum *et al.* 1971). Soft mast includes fruits with soft fleshy exteriors such as berries, drupes, and pomes. Hard mast includes fruits and seeds with hard exteriors such as nuts, samaras, cones, and pods.

Mast production is directly related to plant vigor, age, site index, and position of the plant in the forest canopy. Timber management activities in this forest management plan should increase the mast production potential of the refuge's forested habitat. Zeedyk and Evans (1975) stated: "Rapid crown development and accelerated fruit production of both overstory and understory layers are generally favored with thinning treatments". Crowded timber stands are not conducive to good mast yields, (Collins 1961). Sharp and Sprague (1967) stated that "white oaks grown in the open produce acorns uniformly over the crown, whereas those in a closed canopy produce acorns only on the branches exposed to direct sunlight". This is not only true of oaks and other hard mast producers, but soft mast producers as well. Releasing plants from competition for sunlight, water, and nutrients through forest management activities will increase their mast producing potential.

Maintaining plant species diversity within the forest facilitates a constant supply of mast for wildlife utilization. Species diversity helps to offset the impact of seasonal variations in mast production and species-specific mast crop failures. Varying the size of forest openings within a treatment area will enhance species diversity by creating a variety of forest conditions that are needed to meet the habitat requirements of various plant species.

Although silvicultural treatments release remaining trees and shrubs from competition and allow for better crown development, it does not guarantee that they will be good mast producers. To enhance mast production, careful

attention will be placed on analyzing individual trees by species, age, crown development, canopy location, and overall health during timber marking.

Hard mast is particularly important to most of the mammals found on the refuge, including the threatened Louisiana Black Bear, especially in the fall and winter months. Currently, hard mast producing tree species make up approximately 40% of the total number of trees per acre throughout the refuge.

### **Sawtimber Guidelines**

Hardwood saw timber must have a minimum DBH of 13.6 inches and minimum merchantable length of 12 feet. The diameter of swell-budded species, such as baldcypress, tupelo, and green ash, shall be measured 1-½ feet above swell, when the swell is more than 3 feet high, instead of at DBH.

The upper limit of merchantability is defined as:

1. A minimum top diameter inside bark of 12 inches, or
2. The point at which the tree breaks into forks containing no merchantable saw logs, or
3. One or more live limbs occurring within a vertical span of 1 foot, whose sum of diameter equals or exceeds 1/3 of the stem diameter outside the bark at that point, or
4. A stem deformity

### **Pulpwood Guidelines**

Hardwood pulpwood must have a minimum DBH of 6 inches and minimum merchantable length of 15 feet.

The upper limit of merchantability is defined as: A minimum top diameter inside bark (DIB) of 4.0 inches, or that point at which stem deformity prevents utilization. If at least a full 5-foot section occurs above this point, take the merchantable height to the top of this section. A usable section is one that is reasonably straight and sound and whose small end diameter equals or exceeds 4.0 inches DIB.

### **Forked Trees**

Trees that fork immediately above DBH will be measured below the swell resulting from the double stem. The longest utilizable stem shall be measured for the merchantable height. Trees that fork below DBH shall be considered as two separate trees, and the diameters shall be measured or estimated 3 ½ feet above the fork.

### **Conditions Applicable to Timber Harvesting Permits**

1. A pre-entry conference between the Refuge Forester and the designated Permittee representative will be a requirement before the purchaser starts logging operations. The purpose of the pre-entry conference is to be sure that the purchaser completely understands what is expected of him and thus avoid misunderstanding or serious conflict.
2. If requested, satisfactory scale tickets for timber products shall be submitted to the Refuge Forester.
3. Bottomland hardwood species will be cut in a manner to leave a stump not more than 18 inches above ground. All stump heights are measured adjacent to the highest ground.
4. Skidding is permitted only where designated on the sale map.
5. Ground level paint spots must remain visible after the tree has been cut. All marked trees are to be cut, unless otherwise approved by the Refuge Forester.
6. Trees and tops shall not be left hanging or supported by any other tree and shall be pulled down immediately after felling.
7. No traffic, including trucks, skidders, or any other vehicles, will be allowed to cross through the “Old Growth Area” or “No Cut Zones” adjacent to or near timber sale areas. These areas will be marked and indicated on the sale area map. Cutters should avoid felling trees into these areas as much as possible. When a tree does fall into these areas, the entire tree will be pulled back into the sale area.
8. All roads, right-of-ways, fields, openings, streams, and firebreaks must be kept clear of tops and debris. Permittee shall also repair all damage to same resulting from operations conducted under this permit.
9. Littering in any manner is a violation of the Code of Federal Regulations. The entire work area shall be kept free of litter at all times. Repairs and cleanup work will be accomplished to the satisfaction of the Refuge Manager and/or Refuge Forester.



10. Additional trees removed to prepare loading sites will be paid for at bid prices. Unmarked trees, which are cut or injured through carelessness, shall be paid for at **double** the bid price.
11. The Permittee will remove plugs, dams, and bridges, constructed by the Permittee, upon completion of the contract. There are areas on the refuge where temporary plugs or dams in an intermittent stream would not be allowed. These areas will be indicated on sale maps.
12. Loading of forest products on a public road, road shoulder, or regeneration area is prohibited.
13. Ownership of all products remaining on a sale area will revert to the U.S. Government upon termination of the permit.
14. The Refuge Manager and/or Forester shall have authority to temporarily close down all or any part of the harvest operation during a period of high fire danger, wet ground conditions, or for any other reason deemed necessary. An equal amount of additional time will be granted to the Permittee.
15. The U. S. Government accepts no responsibility to provide right-of-way over private lands for materials sold under this contract.
16. The Permittee and his employees will do all within their power to prevent and suppress forest fires.
17. The decision of the Refuge Manager shall be final in the interpretation of the regulations and provisions governing the sale, cutting, and removal of the timber covered by this permit.
18. When a timber sale area is adjacent to private land, all logging debris will be pulled back onto the refuge to avoid damage to private property.

### **Control Records**

The primary purpose of records is to show progress made in fulfilling the forest management plan objectives. These records will consist of: compartment prescriptions, compartment geographical information system (GIS) maps, sale area GIS maps, timber sale contracts and special use permits, compartment timber volume tables, order of entry plan and progress reports, wildlife information gathered by compartment, and data collected from bird counts conducted throughout the length of the FHMP.

The forested area of the refuge has been divided into 27 compartments (See Map 3) to facilitate record keeping and to provide definite areas small enough so that precise biological and silvicultural evaluation of the forested habitat can be accomplished. These compartments have been designated utilizing existing roads as boundary lines for access and to limit the size of each compartment. Rotating timber management activities throughout the various management units, compartments, and habitat types will allow for a diverse forested landscape throughout the refuge. Reforestation areas in Esque Field and Tiffie Field will not be divided into compartments for this FHMP, but should be appropriately divided as the fields develop into bottomland hardwood forests.

### **Scope of Forest Program**

The purpose of the forest habitat management program is to establish and maintain a diversified forest habitat that best meets the needs of the various wildlife species utilizing the habitat. Both commercial and non-commercial silvicultural treatments can be utilized to produce the desired forest conditions. Commercial timber harvest operations are more economical and will be used to meet the forested habitat objectives of the refuge. The cost to the refuge associated with non-commercial treatments is higher than commercial treatments in terms of manpower and funding. However, non-commercial treatments will be used when commercial operations cannot meet refuge objectives and sufficient funding is available.

### **Description**

#### **Acreage**

Current acreage of the refuge is approximately 13,168 acres. A breakdown of refuge acreage is given on page 3 of this plan.

#### **Topography**

Bayou Cocodrie NWR is located in Concordia Parish, Louisiana approximately 5 miles southwest of Ferriday, Louisiana and 15 miles west of Natchez, Mississippi. Elevations range from 45 feet mean sea level (msl) to 60 feet msl.

Elevation is the most influential factor in determining species composition on a given site. A one-foot change in elevation might change forest cover types from an overcup oak-bitter pecan forest cover type to a sugarberry, American elm, and green ash forest cover type. This change in forest cover types may limit or alter management options on a particular site. For bottomland hardwood forest plant species,

elevation is critical because it controls both the moisture regime and site index. It is of great importance to recognize a “ridge” in the Mississippi River Delta as only one or two feet higher in elevation than the surrounding area. Also, it is important to note that a slight change in elevation often has a greater influence on the species composition, quality, growth, kinds of forage, etc. than a 1,000 foot change may have in the mountains.

## **Drainage**

Bayou Cocodrie traverses the entire length of the refuge and serves as the major drainage for the refuge. Bayou Cocodrie is a meandering tributary of the Red River. Historically, when the Red River reached flood stage, backwater flooding was common within the Bayou Cocodrie watershed. Since the development of water control structures, Bayou Cocodrie’s natural overflow has basically been eliminated.

## **Soils**

According to the 1988 Soil Survey of Concordia Parish, Louisiana published by United States Department of Agriculture Soil Conservation Service, seven soil types or complexes are found on the refuge (See Map 6). The wildlife habitat ratings for each soil type or complex is defined as follows:

Good- indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected.

Fair- indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results.

Poor- indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive.

Very poor- indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

### *Alligator clay*

This is a level, poorly drained soil in low positions on natural levees along old channels of the Mississippi River and its distributaries. Surface layer is medium acid clay and subsoil is very strongly acid or

strongly acid clay. Water and air move through this soil very slowly. Soil is considered “fair” for grasses and legumes, herbaceous plants, hardwood trees, shrubs, and woodland wildlife. Soil is considered “good” for wetland plants and shallow water areas.

*Alligator clay, occasionally flooded*

This is a level, poorly drained soil in low positions on natural levees along old channels of the Mississippi River and its distributaries. This soil is subject to occasional flooding for brief to long periods. The surface layer is very strongly acid clay and the subsoil is very strongly acid or strongly acid clay. The underlying material to a depth of 60 inches is slightly acid clay. Water and air move through this soil very slowly. Soil rates the same as Alligator clay for wildlife and wildlife habitat management.

*Dundee loam*

This is a level, somewhat poorly drained soil in high positions on natural levees along former channels of the Mississippi River and its distributaries. Surface layer is slightly acid loam. The subsoil is very strongly acid clay loam in the upper part and very strongly acid loam in the middle and lower part. Water and air move through this soil at a moderately slow rate. Soil rates “fair” for wetland plants, shallow water areas, and wetland wildlife. Soil is rated “good” for grasses and legumes, wild herbaceous plants, hardwood trees, shrubs, and woodland wildlife.

*Fausse clay*

This is a level, very poorly drained soil in depressional areas on the alluvial plain. This soil is subject to ponding and frequent flooding. Typically, the surface layer is neutral clay about 12 inches thick. The subsoil is slightly acid clay. The underlying material is neutral clay to a depth of about 62 inches. Water and air move through this soil very slowly. Soil is poorly suited for bottomland hardwoods. Soil rates “very poor” for grasses and legumes as well as wildland herbaceous plants. Soil rates “poor” for hardwood trees, shrubs, and woodland wildlife. Soil rates “good” for wetland plants, shallow water areas, and wetland wildlife.

*Sharkey clay*

This is a level, poorly drained, clayey soil on broad flat areas of the alluvial plain. Typically, the surface layer is medium acid clay about 11 inches thick. The subsoil is slightly acid to mildly alkaline clay. The

underlying material to a depth of about 75 inches is neutral or mildly alkaline clay. Water and air move through this soil very slowly. Soil rates “fair” for grasses and legumes as well as herbaceous plants. Soil rates “good” for hardwood trees, shrubs, wetland plants, shallow water areas, woodland wildlife, and wetland wildlife.

#### *Tensas silty clay*

This is a level; somewhat poorly drained soil in intermediate positions on natural levees of old Mississippi River channels. The surface layer is strongly acid silty clay about 5 inches thick. The subsoil is very strongly acid clay and silty clay in the upper part; strongly acid or medium acid silty clay and clay loam in the lower part. Water and air move through the upper part of this soil very slowly and through the lower part at a moderately slow rate. Soil is rated “fair” for grasses and legumes as well as wild herbaceous plants. Soil is rated “good” for hardwood trees, shrubs, wetland plants, shallow water areas, woodland wildlife, and wetland wildlife.

#### *Tensas-Alligator complex, undulating*

These somewhat poorly drained Tensas soils and poorly drained Alligator soils are in intermediate and low positions on natural levees of old Mississippi River channels. These soils are typically 45% Tensas soils and 40% Alligator soils. Tensas surface soils are very strongly acid silty clays. Tensas subsoils are very strongly acid clay in the upper part; strongly acid clay loam in the middle part; and strongly acid silty clay loam and very fine sandy loam in the lower part. Water and air move through the upper part of the Tensas soils very slowly and through the lower part at a moderately slow rate. The Alligator surface soils are strongly acid clay. Alligator subsurface soils are very strongly acid clay in the upper part and strongly acid clay in the lower part. Water and air move through the Alligator soils very slowly. Soil is rated as “fair” or “good” for grasses and legumes, wild herbaceous plants, hardwood trees, shrubs, wetland plants, shallow water areas, woodland wildlife, and wetland wildlife.

#### **Forest Cover Type Classification**

The publication “Forest Cover Types of the United States and Canada” published in 1980 by the Society of American Foresters (SAF) was used in identifying the various forest cover types found on BCNWR, except Type 92.5, which is no longer recognized by the SAF. The description of Type 92.5 was taken from the Forest Habitat Management Plan for Tensas River NWR, 1989. For the scientific names of the various tree species mentioned in the following forest cover type descriptions, use

the table on pages 14 and 15 of this FHMP. The following forest cover types have been identified on BCNWR.

- Type 92 – sweetgum-willow oak
- Type 92.5 – Nuttall oak-American elm-green ash
- Type 93 – sugarberry-American elm-green ash
- Type 96 – overcup oak-water hickory
- Type 101 – baldcypress
- Type 102 – baldcypress-tupelo

*Type 92 – Sweetgum - Willow Oak*

*Definition and composition* – Sweetgum and willow oak comprise a plurality of the stocking, with sweetgum essentially the key species. Willow oak may be superseded by water oak in the southernmost range of the type. Sugarberry, green ash, American elm, and Nuttall oak are major associates, especially on slightly lower elevations. Minor associates are overcup oak, water hickory, cedar elm, eastern cottonwood, laurel oak, red maple, honeylocust, persimmon, and, rarely, baldcypress. This type was formerly named sweetgum – Nuttall oak – willow oak (SAF 1954).

*Geographic distribution* – The type is widespread in the alluvial floodplains of major rivers in Arkansas, Louisiana, Mississippi, Alabama, eastern Missouri, and eastern Texas. Most extensive stands are in the Mississippi River Delta.

*Ecological relationships* – The type perpetuates itself on first-bottom ridges and terrace flats, except in deep sloughs, swamps, and the lowest flats. Usually it is interspersed with the sugarberry- American elm-green ash type (93) and the overcup oak – water hickory type (96). Elsewhere, heavy cutting usually increases the sweetgum component because of that species' sprouting characteristics. The sprouts grow rapidly early and continue growing well on sites where this type occurs. On transitional sites, the sweetgum – willow oak type (92) is usually superseded by the sugarberry – American elm – green ash type (93). Major reasons are the oaks' insufficient acorn crops, poor seedling establishment, and very slow early growth.

*Variants and associated vegetation* – The type becomes predominantly sweetgum on well-drained first-bottom ridges and pervious silty clays on terrace flats. It is predominantly willow oak combined with water oak on clay soils on first-bottom ridges and better-drained flats and on poorly drained terrace flats. Nuttall oak dominates on well-drained, first-bottom flats. Willow oak prevails on first-bottom ridges and poorly drained terrace flats. Near the Gulf Coast, laurel oak dominates. A

cedar elm – water oak – willow oak variant occurs on poorly drained impervious soils on low, indistinct or flattened first-bottom ridges; this variant is also of minor importance on certain impervious terrace sites, amounting to high, shallow flats.

Understory species are sugarberry, green ash, oaks, red maple, and red mulberry. Undergrowth includes greenbrier, dwarf palmetto, and several vines – redvine, peppervine, trumpet-creeper, and poison-ivy.

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*Type 92.5 - Nuttall Oak – American Elm – Green Ash*

*Definition and composition* – The type species, together with water hickory and willow oak are usually predominant. Commonly the associates are cedar elm, overcup oak, sweet pecan, water oak, winged elm, blackgum, persimmon, honeylocust, red maple, and boxelder. Hackberry replaces sugarberry in the northern part of the type range. This type is no longer recognized by the Society of American Foresters (SAF), but will be utilized in stand mapping on Bayou Cocodrie NWR where Nuttall oak represents 40% or more of the stand.

*Nature and occurrence* – This forest type is found throughout the Southern Forest within the flood plains of the major rivers. It occupies low ridges, flats, and sloughs in first bottom and terrace flats and sloughs, and occasionally new lands or fronts, but rarely maltreated terrace ridges. It is a temporary type following very heavy or persistent cutting or fire in the sweetgum – willow oak type (92); or often succeeding cottonwood where it follows heavy cutting alone, when an understory of these tolerant species is present.

*Transition forms and variants* – Occasional small stands of pure green ash may occur almost anywhere within the type but most notably on moist flats or in shallow sloughs. Pure sugarberry (hackberry) stands occur occasionally on new land or front sites.

*Type 93 - Sugarberry – American Elm – Green Ash*

*Definition and composition* – The type species sugarberry, American elm, and green ash together constitute a plurality of the stocking. Hackberry replaces sugarberry in the northern part of the range. Major associates include water hickory; Nuttall, willow, water and overcup oaks; sweetgum; and boxelder. Other associated species are cedar and

winged elm, blackgum, persimmon, honeylocust, waterlocust, red and silver maple, American sycamore, and eastern cottonwood.

*Geographic distribution* – The type is found throughout the southern forests from east Texas to the Atlantic, from the Gulf Coast to southern Illinois. It is found within the floodplains of the major rivers.

*Ecological relationships* - The type is usually located in transitional areas between the sweetgum – willow oak type (92), which occupies higher elevations, and the overcup – water hickory type (96), which occurs at the lower elevations. It occupies low ridges, flats, and sloughs; and occasionally new lands or fronts. Rarely does it occur on maltreated terrace ridges. It may be found on clay or silt loam soils, and it tends to be long term in the successional scale. The type species are all shade tolerant when small and reproduce readily. All three, but especially green ash, sprout prolifically.

*Variants and associated vegetation* – Occasional small stands of pure green ash may occur almost anywhere within the type, but most notably on moist flats or in shallow sloughs. Stands composed predominantly of sugarberry occur on new land or front sites.

The understory commonly includes sugarberry, ash, elm, water hickory, Nuttall oak, overcup oak, red maple, roughleaf dogwood, hawthorn, possumhaw, and red mulberry. Undergrowth includes several vines - trumpet-creeper, peppervine, redvine, rattan (Alabama supplejack), Carolina moonseed, Virginia creeper, grape, and poison-ivy. Herbaceous plants include bedstraw, violet, wild carrot, wild lettuce, amsonia, mint, legumes, sedge, smartweed, and false indigo. When openings are created in the stands, a heavy growth of annual grasses and cocklebur may occur.

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#### *Type 96 - Overcup Oak – Water Hickory*

*Definition and composition* – Overcup oak and water hickory together make up a majority of the stocking. Major associates are green ash, sugarberry, American elm, waterlocust, red maple, and Nuttall oak. Willow oak, persimmon, and cedar elm are minor associates.

*Geographic distribution* – The type occurs in the floodplain forests of the Gulf and south Atlantic states and also in Tennessee and southern



Illinois. The most extensive areas occupied are backwater basins of the principal rivers.

*Ecological relationships* – The type usually occurs in areas where water stands into the growing season – low-lying, poorly drained flats with clay or silty clay soils. It also occurs in sloughs in the lowest backwater basins and on low ridges with clay soils that are subject to late spring inundation. Site quality is usually quite poor and most species cannot survive where this type exists. Where drainage is improved, the type may revert to sugarberry – American elm – green ash type (93). Overcup oak reproduces more consistently than other oaks; its good seed crops are frequent and its acorns, which seem to be less desirable to wildlife than most, receive some protection from the water. Water hickory is a prolific sprouter and reproduces in this fashion when the stand is cut. Both overcup oak and water hickory are among the last tree species to leaf out in the growing season and thus are less subject to the mortality that occurs when seedlings or sprouts in leaf are covered by standing water.

*Variants and associated vegetation* – Nearly pure water hickory stands or pure overcup oak stands can be found representing the type. Sometimes there is a clear demarcation between the overcup oak – water hickory type (96) and the sugarberry – American elm – green ash type (93), but usually the two types mix in a transitional zone.

Understory includes the water hickory, overcup oak, and occasionally Nuttall oak, green ash, sugarberry, roughleaf dogwood, swamp-privet, and planertree (water elm). Undergrowth includes buttonbush and numerous vines – redvine, peppervine, trumpet-creeper, and poison-ivy. Because of the depth and duration of standing water in this type, Associated herbaceous plants are few. Following cutting or partial opening of the stands, heavy growth of annual grasses and cocklebur may occur.

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#### *Type 101 – Baldcypress*

*Definition and composition* – Baldcypress is pure or comprises a majority of the stocking. Its main associates are water tupelo in the alluvial floodplains or swamp tupelo in the swamps and estuaries of the Coastal Plain. Other associates are pondcypress, black willow, and occasionally, swamp cottonwood, red maple, Atlantic white cedar,

American elm, green ash, pumpkin ash, Carolina ash, waterlocust, redbay, common persimmon, overcup oak, and water hickory.

*Geographic distribution* – The type occurs intermittently through the Coastal Plain from southern Delaware to south Florida, and west to southeastern Texas almost to the Mexican border. Inland, it occurs along the many streams of the coastal plains and northward through the Mississippi Valley to southeastern Illinois, and southwestern Indiana.

*Ecological relationships* – The baldcypress species is unusual in form, shape, and habitat requirements. Sites are characterized by frequent prolonged flooding. Floodwaters may be 3 m (10 ft.) deep or more and may be stagnant or may flow at rates up to 7 km (4 mi.) per hour. Cypress knees are common on trees on most sites, but are usually absent where there is no flooding. It is not clear what role cypress knees play in aeration of the root system, but it is known that they exchange oxygen and carbon dioxide with their surroundings under normal atmospheric conditions. Thus it appears that they may be beneficial as an aeration organ but not critical to tree survival.

Baldcypress shows adaptation to flooding similar to those of water and swamp tupelos, the main associates in the type. Under prolonged flooding newly adapted roots develop near the base of the tree. The new roots are more succulent, larger in diameter, and less branched than roots of cypress grown in moist well-aerated soils. Newly adapted roots of tupelos have been observed to oxidize their rhizosphere in floodwaters. Cypress roots also show evidence of oxidation at depths up to 1.2 m (4ft.), thus providing oxygen to active root tips and facilitating nutrient uptake from otherwise highly reduced soil environment. Baldcypress grows along the estuaries near the coast, but apparently cannot tolerate salinities above 0.89 percent salt.

Cypress, highly prized for its lumber, was so heavily exploited during the first half of the 20<sup>th</sup> century that there was much concern for its future. All recent evidence, however, suggests a general replacement by second growth.

*Variants and associated vegetation* – The type has one major variant, baldcypress-pondcypress. Where the two species occur together it is difficult and sometimes impossible to tell them apart. These two intermingle in varying proportions in the lower coastal plains from southeastern Virginia to eastern Louisiana. The baldcypress type (101) has only a few shrub associates and these vary widely. The most prominent in south Florida are common buttonbush, swamp (stiff-cornel) dogwood, and Walter viburnum. In contrast, the most common associates in North Carolina are the coast leucothoe, Carolina rose,

poison-sumac, swamp dogwood, and possumhaw viburnum. In addition, ferns, vines, epiphytes, alligator-weed, and duckweeds are present.

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*Type 102 – Baldcypress – Tupelo*

*Definition and composition* – Baldcypress together with water tupelo or swamp tupelo comprises the majority of the stocking. In deep alluvial swamps, the common associates are red maple, black willow, Carolina ash, pumpkin ash, swamp cottonwood, planertree (water elm), and waterlocust. In the shallower margins, overcup oak, water hickory, American elm, green ash, Nuttall oak, laurel oak, sweetgum, persimmon, and sweetbay are also present. In Coastal Plain swamps, red maple, black willow, redbay, sweetbay, pondcypress, slash pine, and loblolly pine are found. Ogeechee tupelo is an associate in southwestern Georgia and northern Florida. Atlantic white-cedar and pond pine are also present in some acid, peaty swamps of the Atlantic Coastal Plain.

*Geographic distribution* – The type occurs in the southern Coastal Plain, particularly on the seaward margins, from southeastern Texas to Maryland, excluding the lower third of the Florida peninsula. It is also present in the Mississippi River bottom and along the lower reaches of its tributaries north to southern Illinois.

*Ecological relationships* – The type is always found on very wet sites where, in years of normal rainfall, surface water stands well into or throughout the growing season. These include swamps, deep sloughs, very low, poorly drained flats of the major river floodplains, swamps of tidal estuaries, margins of coastal marshes and the deeper, more extensive landlocked depressions of the Coastal Plain.

Soils of the alluvial bottoms are mineral soils and usually range in texture from silt loam to almost pure clay; surface soil pH varies from moderately acid to slightly alkaline. Coastal swamps and depressions of the Coastal Plain usually have a surface of muck or shallow peat. The mineral fraction of the soil may range from fine sand to clay, and soil pH ranges from moderately to strongly acid.

Stand makeup is strongly influenced by site as well as by cutting. Water tupelo cannot survive where soil acidity is high or surface water brackish. Consequently, it is almost completely restricted to alluvial floodplains and is replaced by swamp tupelo on colluvial soils of the Coastal Plain and in coastal swamps. Swamp tupelo also occurs in

mixture with baldcypress and water tupelo around the edges of alluvial swamps where maximum water depth is less than 0.6 m (about 2 ft.). Baldcypress and water tupelo are most tolerant of complete inundation and advance into deepest sites when water depth is reduced during periodic droughts, particularly around quiet ponds and lakes. In shallow swamps, water and swamp tupelo regenerate more successfully than baldcypress because of greater seed production and somewhat faster early growth. Here, following heavy cutting, the type usually reverts to water or swamp tupelo. Regeneration of swamp tupelo and water tupelo by stump sprouts is also of major importance in cutover stands; sprouting of baldcypress is minor.

No clear succession has been observed in this type and, barring aggradation, it is considered permanent and is held in this stage by prolonged periods of deep flooding. The relative shade tolerance of baldcypress and water tupelo has not been clearly established; both are rated intolerant and both endure heavy stocking in even-aged stands. When in association with baldcypress, water tupelo is usually the younger component, suggesting the greater tolerance of the latter and a possible trend towards pure stands of that species without periodic disturbance.

*Variants and associated vegetation* – Small, pure stands of baldcypress are scattered throughout the type. Regeneration of baldcypress is very uncertain, however, and stands usually revert to tupelo following heavy cutting.

In the deep swamps and under dense stands, undergrowth, sparse because of low light intensity and long hydroperiods, is limited to a few shrubs and some aquatic herbs. Mosses and lichens are common on the lower exposed portions of the tree trunks. Spanish moss often drapes the crowns. In shallow swamps and along the fringes of the deep swamps, a wide variety of wet-site shrubs may commonly occur: buttonbush, swamp-privet, Virginia sweetspire (Virginia-willow), swamp cyrilla, buckwheat-tree, stiffcornel (swamp) dogwood, fetterbush lyonia, leucothoes, dahoon, yaupon, southern bayberry, possumhaw, swamp rose, and poison-sumac. Woody vines that may be common include greenbriers, Alabama supplejack, southeast decumaria, crossvine, peppervine, and poison-ivy.

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## **Volume Tables**

Volume tables for each compartment will be expressed in 2-inch diameter classes for both sawtimber and pulpwood. Doyle form class 76 will be used to express volume sawtimber (MBF) and pulpwood (cords) volumes. The exception will be green ash and water tupelo volumes, which will utilize Doyle form class 70.

## **Program Effect on Local Economy**

The forest habitat management plan will have a favorable effect on the local economy by providing jobs associated with timber harvesting. Local businesses should see an increase in sales of supplies related to the needs of a logging crew such as fuel, equipment parts, tires, miscellaneous food and snacks, etc. Other effects should be the same as noted in the 2004 CCP for BCNWR.

To achieve forest management goals, the refuge will be broken down into management compartments (See Map 5). The compartments will be divided in a variety of ways, using landmarks and surface features such as woods roads, brakes, property lines, and Bayou Cocodrie as compartment boundaries. Each compartment will be assigned a number and a year of entry. The year of entry will be assigned to distribute forest management activities across the refuge throughout the duration of this forest management plan. Upon entry into a compartment, the following information will be collected: tree species, tree heights, tree diameters, total basal area, regeneration, canopy condition, vegetation present other than trees (palmetto, vines, shrubs, and herbaceous), forest cover type, signs of wildlife activity (such as cavities, nests, dens, etc.) and snags will be noted. This is a minimum to be collected, other data may be added according to staffing and time constraints. The information collected will be evaluated by the forester and other refuge staff and used to write a prescription for the compartment. The prescription will give a description of the results of the cruise and prescribe the actions to be taken for the compartment. The forester and refuge manager will sign the prescription and forward it to the Regional Office for review and concurrence.

After approval of the compartment prescription, implementation of any treatments prescribed will begin.

## **Research Needs**

Wildlife habitat management on a bottomland hardwood forest dominated habitat, such as BCNWR, is dependent upon knowing the interactions between the forest and wildlife species that use the habitat. Research is needed to study these interactions and determine the best management

options available to satisfy the habitat needs of the various wildlife, plant, and insect species found on the refuge.

Specific research should focus on:

1. Evaluating the effect of silvicultural practices on wildlife and plant populations
2. Analysis of forest stand dynamics.
3. Identification and control of non-native flora and fauna.
4. Determining species of greatest concern and their needs.
5. Identification of insect and disease problems that may exist or develop.

### **Policy of Harvest**

Most of the forest habitat improvement operations on the refuge will be conducted using commercial harvest contractors, as this is the most efficient way to meet refuge objectives. When commercial harvest is not an option, refuge staff along with interns, volunteers, educational institutions, or summer youth program enrollees may be used to complete desired habitat improvement projects.

#### *Harvest Operations*

Timber harvest operations will be restricted to the months of July through November. This is normally the driest part of the year on the refuge. Restricting logging to the driest periods of the year will help keep soil disturbance and damage to residual vegetation at a minimum. Another concern that will restrict logging to this time period is the nesting and breeding activities of various bird species. By restricting harvest activities to this time period, disturbance of bird nesting and breeding activities of most bird species should be minimized (*per. com., Chuck Hunter, USFWS*).

Haul roads for commercial timber harvest operations will be limited to existing roads only. This will help reduce fragmentation of the habitat and limit disturbance to soil and plants throughout the refuge. Roads used during harvest operations may be heavily used by black bears as movement corridors. Road edges that receive direct sunlight may provide substantial amounts of soft mast (fruit), where otherwise closed canopy forests make this important food source rare (*Perry et al, 1999*). Edge habitats along roads may be important for reasons stated above, but should still be limited because of concerns of increased predation of bird nests,

and effects of roads on amphibian movements (*Gibbs 1998*, and *deMaynadier and Hunter, 2000*).

Logging operations will be allowed to use skidders, crawler tractors, and wheeled tractors to skid logs to loading areas where they are loaded onto trucks. Tree-length skidding will be allowed, but the trees must have the tops and all limbs removed before skidding. Removal of tops and limbs will reduce chances of damage to residual trees. Other special conditions and/or restrictions, as determined by refuge staff, may be stated in the Timber Sale Bid Invitation and Special Use Permit awarded to the highest bidder for the Timber Sale Bid.

#### *Compartment Order of Entry*

The following Order of Entry covers those forested compartments, including the Old Growth Natural Area and No Cut Areas. Each compartment will be cruised, evaluated, and prescriptions for treatment written according to the entry cycle designated in the Order of Entry. Deviation from the Order of Entry will only be allowed in extreme circumstances such as insect and disease outbreaks that may affect forest health.

#### **Order of Entry 2005-2020**

Year to Enter	Compartment	Acres	Total Acres
2005	Brooks Brake 6 Old Growth Brooks Brake 2	775.3 369.4	1144.7
2006	Brooks Brake 3 Brooks Brake 1	267.3 344.0	611.3
2007	Cross Bayou 4 Cross Bayou 6	506.1 739.6	1245.7
2008	Wallace Lake 2 Wallace Lake 4	361.9 477.1	839.0
2009	Brooks Brake 10 Brooks Brake 7	358.1 691.3	1049.4
2010	Cross Bayou 5 Cross Bayou 2	627.5 327.1	954.6
2011	Wallace Lake 6 Wallace Lake 5	309.7 532.6	842.3
2012	Brooks Brake 4 Brooks Brake 9	349.7 153.4	503.1
2013	Cross Bayou 1 Cross Bayou 8	150.0 160.8	310.8
2014	Wallace Lake 1 Wallace Lake 3	254.4 495.3	749.7

2015	Brooks Brake 5 No Cut Zone Brooks Brake 8	500.3 594.7	1095.0
2016	Cross Bayou 3 Cross Bayou 7	258.9 547.3	806.2
2017	Wallace Lake 7 No Cut Zone Cross Bayou 9 No Cut Zone	158.6 45.3	203.9
2018	Evaluate additional acreages added to Refuge during FMP		
2019	Write new CCP and FMP		

Total Forested Acres for the FHMP is 10,355.7

\* Acreage Values expressed in this table are GIS acreage estimates.

### *Compartment Inventory*

Following the Order of Entry, a habitat and timber cruise will be conducted for each compartment. The cruise may be conducted using fixed plot and point sampling techniques. Most cruise sampling will be done using a fixed radius plot of 1/5<sup>th</sup> acre for saw timber, 1/20<sup>th</sup> acre plots for pulpwood, and 1/100<sup>th</sup> acre plots for regeneration and herbaceous ground cover. Point samples utilizing 10, 15, or 20 factor prisms may be used at various times for collecting timber volumes. The following data will be collected during each compartment cruise:

1. Timber volumes including basal area for sawtimber and pulpwood
2. Species composition of woody vegetation
3. Tree ages
4. Canopy conditions
5. Presence of vines, Spanish moss, and switchcane
6. Herbaceous ground cover
7. Number and size of den, cavity, and cull trees per acre
8. Tree and shrub species regeneration
9. Species composition of each canopy layer (overstory, midstory, understory, and ground cover)
10. Presence of woody debris

### *Compartment Prescriptions*

Compartment prescriptions will contain the following information:

1. Compartment map
2. Stand map designating various timber stands within the compartment



3. Description of compartment including vegetation profile, soil types, hydrology, and other physiological features
4. Timber data including tree species composition, sawtimber and pulpwood volumes, stocking, age, condition, and basal area.
5. Wildlife habitat parameters including plant composition of overstory and understory; number of cavity and den trees; presence of vines, Spanish moss, and switchcane; number of dead snags; presence of woody debris; and evidence of wildlife activity (e.g. bird nests, browsing of plants, wildlife tracks, etc.)
6. Composition of woody plant regeneration
7. Prescription of silvicultural treatment to be conducted in the compartment
8. Description of desired results
9. Map of Treatment Area
10. Timber data for the Treatment Area showing what is to be removed during treatment

After the Compartment Prescription is written, it will be submitted to the Regional Office for approval. Copies of Compartment Prescriptions and all other information will be kept on file in the refuge office.

### *Monitoring*

Upon completion of prescribed timber harvest operations, each treatment area will be monitored periodically to see if desired results of the compartment prescription have been met. This will help the refuge staff to determine what changes, if any, may be needed for future forest management prescriptions.

To monitor the impact of timber management activities on migratory birds, a bird-monitoring program is being developed in cooperation with the Lower Mississippi Valley Joint Venture office. The information gathered from the bird-monitoring system will assist in identifying the impacts of timber harvest on bird populations, as well as other wildlife species, before and after treatment. This information will help adapt timber management activities to the needs of the many plant and animal species utilizing the forested habitat of the refuge.

### **GIS and GPS Databases**

A Geographical Information System (GIS) and Global Positioning System (GPS) database is currently being developed on the refuge. The current refuge GIS database consists of various image files including Digital Orthophoto Quarter Quads (DOQQ's), Digital Raster Graphs (DRG's) of USGS topographic quad maps, and 10- 15- 30-meter resolution satellite

images. Shapefiles, from a variety of different state and federal agencies provide mapping layers for federal and state highways, local roads, parish boundary lines, powerline and pipeline rights-of-way, reforestation projects on private and public lands, public land boundaries, and various other layers providing information about the area surrounding the refuge.

For the forest management plan, GIS shapefile layers will be developed on a local scale to reflect the refuge management activities. To enhance the development of a GIS database that is specific to the refuge, GPS technology will be used to establish compartment boundaries, maps, cruise lines, treatment area maps and boundaries, monitoring programs, logging access routes, areas of special concern, refuge roads, beaver activity, cultural resources, forest cover types, map reforestation areas, and all other management activities related to the refuge.

### **Sale Folders**

A sale folder will be prepared and maintained for each individual timber sale. The folder shall contain copies of all data collected for the sale. This includes tally sheets, volume estimates, maps, bid invitation, Special Use Permits, payment records, correspondence with permittee, sale compliance inspection notes, copies of deposit checks, payment transmittal forms, etc. The sale folder shall be kept in a separate folder within the compartment folder for each individual compartment, thus keeping all information pertaining to a compartment within a single file.

### **Old Growth Forest Area**

The Old Growth Forest Area is located in the southern portion of the Brooks Brake Unit of the refuge (See Map 7). This area is designated for protection in the BCNWR Comprehensive Conservation Plan (CCP). The FHMP has increased the size of the Old Growth Forest Area from 750 acres (as designated in the CCP) to approximately 775 acres. The additional acres were added in an effort to simplify the boundary of the Old Growth Forest Area, without losing any of the acreage in the original designation. Information gathered from various sources indicates that this area has not been logged since the 1930's, thus making this one of the least disturbed bottomland hardwood forest habitats remaining in the Louisiana portion of the Lower Mississippi Valley.

This area provides a good example of an uneven-aged forest that has developed through tree-fall gaps. Average DBH is approximately 16 inches, with larger diameter trees (36+ DBH) scattered throughout the area. Dominant tree species are sweetgum, red oaks (including water oak,

willow oak, and Nuttall oak), green ash, overcup oak, and bitter pecan. The CCP for BCNWR designates that all future forest management on the refuge should mimic the forest conditions found in The Old Growth Forest Area.

### **No Cut Zones**

#### *Brooks Brake Unit Compartment 5*

In an effort to increase the amount of undisturbed forested habitat, and to meet the habitat needs of some wildlife species, Compartment 5 (as designated on the compartment map in FHMP) of the Brooks Brake Unit of the refuge will be designated as a “No Cut Zone”. This area was chosen because it is located along the northern boundary of the Old Growth Forest Area, and combined with the Old Growth Forest Area, forms a continuous forested area of approximately 1275.6 acres that will be undisturbed by logging activities (See Map 7). Other management activities such as beaver control, trail maintenance, public hunting, and fire management will continue as needed to meet refuge objectives.

This area contains the greatest concentration of secondary meander scars found on the refuge. These secondary meander scars form a series of small, shallow-water forested wetlands unique to this area of the refuge and The Old Growth Forest Area. The term swale is typically used to describe these secondary meander scars, but the term is too general in description and does not distinguish the difference between these small secondary meander scars and the larger, deeper brakes. Most of the forested wetlands on the refuge are in brakes, which are larger in size and hold water for longer durations of time. Most of the ridges in this area were logged from 1986-1988, while the wetter sites were relatively untouched because of limited logging access due to wet soil conditions.

#### *Cross Bayou Unit Compartment 9*

This compartment consists of approximately 45 acres that include the BCNWR headquarters and maintenance shop facilities (See Map 7). This area also contains a hiking trail and wildlife observation platform recently established by the refuge to increase wildlife observation opportunities for the public. The refuge staff also utilizes this area as a classroom for environmental education.

#### *Wallace Lake Unit Compartment 7*

This compartment consists of approximately 159 acres and is separated from other parts of the refuge by a parish road (See Map 7). The refuge's volunteer quarters are located on the southwestern corner of the compartment and will be used by volunteers and refuge staff for environmental education purposes. Refuge management is planning to utilize this area as a classroom for environmental education, as well as develop handicap accessible hiking trails for wildlife observation. The development of this compartment for the purposes listed above will increase the refuge's ability to meet public use priorities such as wildlife observation and environmental education.

## **VI. Special Management Considerations and Techniques**

### **Louisiana's Natural and Scenic Rivers**

The portion of Bayou Cocodrie that runs through the refuge is listed by the State of Louisiana as a Natural and Scenic River. Regulations concerning this designation are outlined in a manual titled "Recommended Forestry Best Management Practices for Louisiana" published in 2000. All forest management activities on the refuge will comply with the regulations set forth in the Forestry Best Management Practices (FBMP) manual. To make sure that the refuge is in compliance with the FBMP regulations concerning Natural and Scenic Rivers, all forest management operations on the refuge will leave a 200-foot buffer along the banks of Bayou Cocodrie.

### **Fire Management**

Presently the only fire management activity occurring on the refuge is fire suppression. Fire is not recommended for use in bottomland hardwood management with the possible exception of seedbed preparation for reforestation. Any areas of the refuge that may utilize fire as a management tool will be addressed in the Fire Management Plan for the refuge.

### **Archeological and Cultural Resources Management**

The Archeological Resources Protection Act of 1979 obligated the refuges to protect all sites of archeological and historical significance. According to the CCP for BCNWR, archeological site investigations in the area of the refuge have been limited and there has never been a detailed investigation documented on the refuge.

It is possible that forest management activities on the refuge could disturb some unknown archeological site. Thus to minimize the chance of such disturbances the following actions will be taken:

1. All forest management prescriptions will be submitted to the Regional Archeologist for approval prior to the start of any logging activities.
2. Logging will be limited to dry soil conditions, thus limiting soil disturbance and erosion.
3. Limit new road construction to reduce the chance of disturbance.
4. Cease logging operations and flag any suspected archeological sites that may be discovered during logging operations
5. Contact the Regional Archeologist if any suspected archeological sites are discovered and follow instructions given by the Regional Archeologist to protect the site until a thorough investigation of the site can be conducted.

### **Aesthetics**

Aesthetic values fall under the category of wildlife observation, which is one of the six priority public uses of refuges designated in the National Wildlife Refuge System Improvement Act of 1997. Although aesthetic values vary from person to person, forest management activities will use the following guidelines to ensure that wildlife observation opportunities for the public are not impeded:

1. Keep logging loader sets at least 100-feet away from designated hiking and ATV trails.
2. Maintain a 200-foot buffer along the boundary of all major waterways. Road construction, loader sets, and skidding of logs will be prohibited within this buffer. All logging debris will be removed from within the buffer boundary.
3. Keep logging slash piles away from designated hiking and ATV trails.
4. Limit height of slash piles to less than 4 feet in logging areas and loader sets, unless otherwise directed for wildlife habitat improvement purposes.
5. Ensure all logging access roads are maintained and free of litter and debris while logging activities are in progress.
6. Rotate forest management activities between the three management units of the refuge so that each unit is only entered for treatment every 3 years.

### **Forest Openings Management**

Forest openings on the refuge will be managed as temporary openings. These are openings created during logging operations either as patchcuts or loader sets. The patchcuts, 1-3 acres in size, are designated during timber marking to develop temporary openings in

the forest canopy large enough to encourage the development of shade intolerant plant species. Loader sets are areas opened up by the logging contractor for the loading of forest products onto trucks. Loader sets usually range in size from ¼ to ½ acre in size and soil disturbance is greater in these areas than any other areas within the timber sale. In an effort to lessen the risk of soil erosion during wet periods in loader sets, these areas may be planted with winter grasses to serve as a temporary vegetative cover until normal vegetation has a chance to reclaim the site. Rotation of timber harvest areas between the three management units will allow for temporary openings to be created throughout the refuge on a continual basis to replace older forest openings as they close up.

### **Protection of Soil and Water Quality**

Most of the soils on the refuge are listed as heavy clays with some silty loams. These soils are finely textured and poorly drained with low permeability. According to the Soil Survey of Concordia Parish, Louisiana, the refuge is broken down into seven soil types. The seven soil types are:

1. Tensas-Alligator Complex- found on most of the ridges on the refuge
2. Alligator Clay- found in flats
3. Alligator Clay, occasionally flooded- found on flats, subject to occasional flooding for brief long periods
4. Sharkey Clay- found in lower portion of ridges and shallow swales
5. Fausse Clay- found in lowest sites on refuge; cypress-tupelo brakes
6. Dundee Loam- found on highest sites on refuge; uncommon on refuge
7. Tensas Silty Clay- found on high sites on refuge; uncommon on refuge

Logging is restricted to the summer and early fall, which are generally the driest times of the year, to reduce soil compaction and erosion potential. Logging access roads will be limited to existing woods roads left over from previous ownership whenever possible. New road construction will be kept to a minimum and must be approved by the refuge manager.

The 200-foot buffer along major waterways and permanent water areas will help keep logging debris out of water channels. These buffer areas will also serve as filtration strips to reduce sediment loads that may be caused by logging activities. Treetops and other logging debris will be kept out of brakes and swales to minimize any impacts

that logging activities may have on drainage. The number of crossings through swales and brakes will be kept at a minimum to prevent damage to the natural drainage of water. These crossings will be maintained and any structures such as culverts will be removed as soon as logging activities are completed.

### **Afforestation Areas**

The reforestation areas on the refuge will not be considered for timber management activities at this time since the oldest areas were planted in 1996. Firebreak maintenance is the only management activity to be conducted in these areas during the 15-year timeframe of this FHMP.

### **Insect and Disease Control**

The most practical way to control insects and diseases that may affect the forested habitat on the refuge is to promote stand conditions favoring healthy vigorous trees. Trees stressed by overstocking, flooding, drought, overmaturity, fire, etc., have an increased susceptibility to insects and diseases. Forest management activities such as thinnings and group selection cuts will help promote tree health and vigor by reducing competition and stocking as well as maintaining tree species diversity. Maintaining a forest that is diverse in species composition is also a key factor to take into consideration at this time.

Most of the disease and insect damage found on the refuge presently is limited to individual trees or small groups and should not pose a threat to the health of the forest. The presence of tree diseases and insects is a normal occurrence in the forest. Many neotropical bird species forage on insects that damage trees, while other wildlife species forage on the conks and other fruiting bodies of various diseases. Portions of trees damaged by insects and diseases may eventually develop into cavities available for wildlife use.

Upon entry into a compartment, insect and disease damage will be evaluated and taken into consideration as part of the compartment cruise. In situations where insect and/or disease conditions are considered severe, the refuge forester will try to identify the problem and consult with the Forest Health Unit of The United States Forest Service Southern Region State and Private Forestry Division in Pineville, Louisiana for advise on how to effectively control the problem.

### **Pest Management**

The two major forest pests on the refuge, other than insects and diseases, are feral hogs and beavers. Beavers are a native wildlife species found on the refuge that has the potential to cause tremendous damage to the forested habitat. The dams they construct benefit waterfowl and other wildlife species by increasing the amount of water in the forest, but this can lead to increased mortality and a reduction in growth rates and mast production for many trees and shrubs if the water is impounded too late into the growing season. Beavers also kill trees and shrubs by girdling them to feed on the phloem of the woody stems. To reduce the impact of beaver activities on the refuge, beaver dams should be destroyed at least once a year during the spring in area where potential damage may occur. In the past when the MAV contained over 20 million acres of bottomland hardwood forests, damage by beavers was probably not significant, but today with only fragmented remnants of the once vast bottomland hardwood forests of the MAV remaining, we cannot afford to allow beaver activity to go uncontrolled.

Feral hogs are an introduced species that cause severe damage to the plant and wildlife communities on the refuge. They compete with native wildlife species for available food resources as well as prey on smaller mammals, birds, and reptiles that nest or live on the ground. Feral hogs also damage plants and plant regeneration by digging to forage on roots and insects. Since these animals are not a native wildlife species, they should be removed from the refuge. In an effort to eradicate the population of feral hogs on the refuge, the refuge staff traps them throughout the year and encourages hunters to harvest them during the refuge's hunting seasons.

### **Alien Plant Species**

Executive Order 13112 of February 3, 1999, defines "alien species", with respect to a particular ecosystem, as any species, including its eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem. Executive Order 13112 allows for federal agencies to identify, monitor and control alien species in consultation with the Invasive Species Council.

For Bayou Cocodrie NWR, the alien plant species of highest concern on the refuge are Chinese tallowtree (*Sapium sebiferum*) and Chinese privet (*Ligustrum sinense*). Both species were introduced into this country from China for use in ornamental landscaping. These species are well adapted to the ecosystem of the refuge and are aggressively establishing their presence. Alien plants such as these are considered a threat to the native flora and fauna of the refuge because they displace



native plants and interrupt the delicate connectivity between native ecosystem components.

Another area of concern for the management of alien plant species is the introduction of plant species to the ecosystem that are native to the surrounding geographic area, but not indigenous to this particular ecosystem. Loblolly pine (*Pinus taeda*), white oak (*Quercus alba*), southern red oak (*Quercus falcata*), flowering dogwood (*Cornus florida*), black cherry (*Prunus serotina*), and yellow poplar (*Liriodendron tulipifera*) are some examples of such species. The establishment of various levee systems within the Lower Mississippi River Valley during the 1900's has reduced the impact of floodwaters from the Mississippi, Red, Tensas, and Black Rivers on BCNWR and the surrounding area. Before the establishment of the current levee system in this area, flooding was the greatest source of disturbance in this ecosystem. Many factors associated with these flood events such as duration, time of year, number per year, and area covered had a major influence on the plant species that developed in this ecosystem. Limiting and/or eliminating the flood regime that once dominated this ecosystem have increased the potential for many alien plant species to survive and spread into the ecosystem. Researching historical publications that identify what plant species are native to the ecosystem should help in planning for current and future reforestation and/or habitat reclamation projects within the ecosystem. This will help limit the introduction of alien plant species onto the refuge by ensuring only native species are selected during planting projects as well as identifying which tree species should be targeted for removal during forest habitat improvement operations.

### **Timber Salvage and Unscheduled Harvesting**

Salvaging damaged timber, dead, or down trees following natural events such as ice storms, tornadoes, windstorms, wildfires and etc. is a common practice in forest management. Forest management on Bayou Cocodrie NWR will only consider salvaging timber to reduce fire hazards or prevent the likelihood of insect or disease outbreaks. These natural events usually provide wildlife species with many habitat needs such as snags for cavities, new denning locations, diversifying the canopy structure, increased plant diversity on the forest floor, etc.

Unscheduled harvesting may occur to prevent the loss of timber due to outbreaks of insects or disease. If an outbreak of insects or diseases should occur, it may be necessary to enter into a compartment ahead of the entry cycle to stop or slow the outbreak.

## **Bid Invitations**

Commercial timber sales are the most practical method available for creating and maintaining desired forest habitat conditions. All timber sales will be conducted in accordance with the requirements listed in the Refuge Manual (5 RM 17 and 6 RM 3), and the guidelines and specifications detailed in the Bayou Cocodrie CCP, Bayou Cocodrie Forest Management Plan, and compartment prescriptions.

Small sales (estimated receipts less than \$2,500) will be negotiated as authorized by U. S. Fish and Wildlife Service policies. The Refuge Forester will make a reasonable effort to obtain at least three bids from potential buyers. These bids will be documented and a permit will be issued to the successful bidder.

Larger timber sales (estimated receipts more than \$2,500) will be conducted through a formal bid procedure. Invitations to bid will be prepared and administered by refuge personnel. Formal bid invitations will be mailed to all prospective bidders (**Exhibit 1**). Bid invitations will contain the following information:

1. A Formal Bid Information Form containing sales and estimated volume information.
2. A bid form, which the bidder fills out, signs, and returns to the refuge.
3. Maps giving general sales location information and detailing all sales units.
4. General conditions applicable to harvest of forest products.
5. Special conditions applicable to the timber sale.
6. Certificate of Independent Price Determination.
7. Equal Employment Opportunity Clause (Form 3-176).
8. Information on dates when prospective bidders can evaluate sales areas before bid opening.

## **Bids and Performance Deposits**

For all bid sales, a bid opening date and time will be set to occur at the refuge headquarters. All bids received prior to the opening time will be kept, unopened and locked in the Refuge Cashier's safe until the specified opening time. Any bids received after the specified opening time will not be accepted. The refuge retains the right to reject any and all bids, particularly those that are incomplete or otherwise unacceptable.

A deposit of \$5,000 to \$10,000 in the form of a cashier's check or money order made out to the U. S. Fish and Wildlife Service, must

accompany all bids received through the formal bid process. The deposit amount will reflect the size of the sale and potential for damage. The amount of the deposit will be stipulated in the bid invitation. This deposit is to ensure the sincerity of the bidder's intention to purchase the offered sale at the bid price. In the event the successful bidder chooses not to purchase the offered timber, the bid deposit will be forfeited to the government. When the successful bidder is named, all unsuccessful bidders' deposits will be immediately returned. The successful bidder's deposit will then become his performance guarantee deposit and will be retained by the government as such. Before the completion of the operation, the successful buyer will repair any and all damages caused by his operation. The performance guarantee deposit may be used to cover any un-repaired damages caused by the successful bidder, their agents, employees, or their contractors. The balance of the deposit will be refunded to the successful bidder when the sale and all related repairs are completed.

Small sales through the negotiated process will also require a performance guarantee deposit to be received by the government prior to any timber harvest.

### **Special Use Permit**

Upon selection of a successful bidder by the Refuge Manager or designated representative, a Special Use Permit will be issued containing information relevant to the timber sale, such as terms of payment, authorized activities, General and Special Conditions, and location map. The Refuge Manager or designated representative, upon receipt of payment, signs the Permit, if the value is within their warranted authority. If the value is above that amount, an authorized representative of the Regional Director signs the Special Use Permit.

### **Payment for Forest Products and Administration of Receipts**

The successful bidder (hereafter referred to as the permittee) will have 10 business days after notification of award of bidding to make total or partial payment (according to what is specified in the Special Use Permit). Under no circumstances will harvest operations begin prior to receipt of payment. The purpose of an advance payment is to encourage the permittee to begin harvesting operations as quickly as possible. All payments will be in the form of a cashier's check or money order payable to the U. S. Fish and Wildlife Service.

All receipts for forest products along with proper documentation will be forwarded the same day received to the Fish and Wildlife Service

Finance Center. Any receipts, that cannot be processed the same day received, will be stored in the Refuge Cashier's safe until processing can be completed. Presently, receipts for the sale of products of the land are deposited into the Revenue Sharing account at the Finance Center. Other arrangements can only be made in accordance with policy, regulations, and laws.

Refuges are authorized to enter into Timber for Land Exchanges. In this process, land within the approved Refuge Acquisition Boundary may be purchased indirectly through exchange of normal timber sale volumes. Requirements for timber for land exchange sales are as follows:

1. Authority, which allows the Service to exchange timber for lands: National Wildlife Refuge System Administration Act of 1966 (16 USC 668dd-ee).
2. Lands acquired must be located within the approved refuge acquisition boundary. No Preliminary Project Proposal or any other studies are required. The merit of the acquisition is a judgment call by the Refuge Manager.
3. Forest management plans are followed, and no deviation from planned schedules should be considered. No additional timber harvest is considered for the sole purpose of acquiring land.
4. The land is conveyed to the United States in exchange for refuge timber or other refuge products. The timber is transferred via Special Use Permit, much the same as a timber sale. If timing requires the timber to be harvested prior to closing on the land, the Permittee can make a performance deposit equal to the value of the deed. That deposit is refunded upon completion of the deed transfer.
5. The Service receives compensation for the timber when the third party acquires the subject property and conveys it to the United States.
6. The value of the land to be acquired, and the timber exchanged should be approximately equal or the value of the timber higher than the land. Any excess value of the timber can be made as a payment to the Service for the difference.

7. The Division of Realty will be responsible for land appraisals, title insurance, reimbursement of relocation costs, and recording fees resulting from the conveyance of the property to the United States. These miscellaneous costs will be paid from Division of Realty funds.

A sequence of steps for a hypothetical timber for land exchange is as follows:

1. Refuge Manager identifies areas within the approved refuge acquisition boundary for acquisition.
2. Refuge Manager and Division of Realty determine if landowner(s) are willing sellers.
3. If seller is willing to sell, the Refuge Manager notifies the Regional Office (District Manager and Division of Realty).
4. Division of Realty contacts the landowner, orders the appraisal, and makes an offer to the landowner.
5. If the landowner is willing to sell, Realty advises the Refuge Manager.
6. The Refuge Manager and refuge staff shall determine which upcoming timber sales, awaiting the timber sale bid process, to use in the exchange.
7. Timber Sales bids are sent out with a description of the responsibilities of the winning bidder pertaining to the timber for land exchange. This gives the bidders an opportunity to determine if they are willing to participate in the timber for land exchange. This also ensures that bidding for the timber is competitive.
8. The Refuge Manager selects the winning bidder following the normal timber sale bid process. The winning bidder is now referred to as the third party.

9. Division of Realty advises the landowner that the third party will intercede to acquire the subject property on the Service's behalf.
10. Division of Realty obtains an exchange agreement with the third party. The agreement (1) identifies and states the price of the subject property, and (2) stipulates the volume and value of timber involved in the refuge's timber sale.
11. The third party acquires the subject property at the appraised value.
12. The third party conveys the subject property to the United States via a warranty deed. A Special Use Permit is issued by the Refuge Manager, which specifies the requirements that must be followed by the third party while cutting on the refuge. The Special Use Permit becomes part of the closing documents.
13. The third party completes logging operation within the specified time frame, as detailed in the Special Use Permit.

### **Administration of Harvesting Operations**

In order to confirm harvest procedures and address any questions, a pre-entry conference will be held between the Refuge Manager and/or Refuge Forester, Permittee, and the logging contractor, if different than the Permittee. The Permittee is to notify the Refuge when harvesting operations begin and are completed.

Close inspection and supervision of all timber sales is necessary to ensure that harvesting operations meet the conditions of the Special Use Permit and refuge objectives. Frequent inspections of harvesting operations will ensure that only designated trees are cut, and problems are rectified before becoming major issues. Timber harvesting operations may be suspended or restricted any time that continued operation might cause excessive damage to the forest stands, soil, wildlife habitat, or cultural resources. Reasons for suspension or restriction may include, but are not limited to: periods of high wildfire potential, insects or disease hazard, times when harvesting may interfere with essential refuge operations, during periods of heavy rains or wet conditions which may cause rutting and erosion of soils,

when harvesting operations present a safety hazard, or when harvest operations reveal new or may damage existing cultural resources. Furthermore, operations may be suspended or terminated if the Permittee violates the conditions of the Special Use Permit.

When harvesting is complete, the Refuge Forester or designated Refuge Staff will inspect the site for compliance with all requirements of the contract. If any deficiencies are found, the Permittee will be notified and given reasonable time to achieve compliance. If full compliance is achieved, the Permittee's performance deposit will be returned in full. If not, an amount to mitigate damages will be deducted from the performance deposit and the remaining amount returned.

## **VII. Attachments**

### **Exhibit 1. Timber Sale Prospectus and Invitation for Bids**

#### **TIMBER SALE PROSPECTUS AND INVITATION FOR BIDS TIMBER SALE COMPARTMENT \_\_\_\_\_ YEAR \_\_\_\_\_ BAYOU COCODRIE NATIONAL WILDLIFE REFUGE**

Sealed bids will be accepted at the office of the U.S. Fish and Wildlife Service, Bayou Cocodrie National Wildlife Refuge, 3391 Poole Road, Ferriday, Louisiana (mailing address – Bayou Cocodrie NWR, PO Box 1772 Ferriday, LA 71334) until 10:00 A.M., specified day and date. At 10:00 A.M. bids will be opened for the sale of an estimated \_\_\_\_\_ board feet (Doyle) of hardwood sawtimber and \_\_\_\_\_ cords of hardwood pulpwood in standing trees marked for cutting in Timber Sale \_\_\_\_\_. The sale occupies about \_\_\_\_\_ acres in Township\_\_\_\_, Range \_\_\_\_\_, Section \_\_\_\_\_, Concordia Parish Louisiana.

Orange-painted saplings designate the sale boundaries. All trees to be cut are marked with blue paint at eye level and on the stump. All trees marked shall be cut, except as otherwise agreed by both parties.

Interested bidders may use ATVs to inspect the sale area prior to the bid opening. All company representatives shall carry a copy of this bid invitation with them during the inspection of the sale area.

Bidders are advised to make their own volume determination. The Service does not guarantee volumes given herein.

A list of special conditions that apply to this timber sale is attached. It will become part of the Special Use Permit issued to the successful bidder. The Service does not issue a "timber deed"; the Special Use Permit serves as the sale document.

Logging operations must be completed by November 15, \_\_\_\_\_, unless an extension of contract time is granted. However, 50% of the sale acreage must be logged by November 15, \_\_\_\_\_, of the first year of the sale in order to qualify for possible extension.

Tree-length logging is allowed, but skidding damage to residual trees must be kept to a bare minimum. Excessive rutting will not be allowed.

Access will be by way of \_\_\_\_\_ road. The permittee will be responsible for routinely maintaining this access route with a motorgrader during the sale.

A \$5,000 bid deposit, by certified check or bank draft made payable to the U.S. Fish and Wildlife Service, must be submitted with the bid. Deposits of unsuccessful bidders will be returned immediately after the bid opening. The successful bidder's deposit will be retained by the Service, and may be forfeited to the government if that bidder fails to accept and execute the permit agreement. After the permit agreement is finalized, the deposit will serve as a performance bond for the sale. The performance bond, less any penalties imposed, will be returned to the permittee after the sale is completed. The successful bidder must submit payment in full for the sale within 10 days after receiving the Special Use Permit for signature.

All bids must be sealed and plainly marked "Timber Bid". Use the attached Bid Form. The Service reserves the right to reject any and all bids.

Direct any questions regarding this sale to John Simpson, Refuge Forester (Phone 318-336-7119, FAX 318-336-5610).

### **Attachments**

- 1- Bid Form
- 2- Maps
- 3- Special Conditions
- 4- Tables of Volume and Number of Stems
- 5- Certificate of Independent Price Determination
- 6- Equal Employment Opportunity Clause



Attachment 1. Bid Form, Timber Sale \_\_\_\_\_

<p style="text-align: center;"><b>Bid</b> <b>Timber Sale Compartment ____ Year ____</b> <b>Bayou Cocodrie National Wildlife Refuge</b></p> <p>Mixed Hardwood Sawtimber – estimated _____ board feet (Doyle) Mixed Hardwood Pulpwood – estimated _____ cords</p> <p style="text-align: center;"><b>LUMP SUM BID \$ _____</b></p> <p>Company Name and Address</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>Signature/Title (signature verifies that bidder abides by restrictions set forth in attached Certificate of Independent Price Determination)</p> <p>_____</p>
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**Attachment 2. Location Map, Timber Sale \_\_\_\_\_**

**Sale Area Map, Timber Sale \_\_\_\_\_**

### **Attachment 3. Special Conditions, Timber Sale \_\_\_\_\_**

1. The permittee will submit payment in full for this sale within 10 days after receiving the Special Use Permit for signature. (This sale may involve an exchange of timber for a conservation easement on private land. If that occurs, the permittee will make a payment directly to the landowner for part or all of the accepted bid, as well as a payment to the Service for the remainder, if any). The Service will retain the permittee's bid deposit of \$5,000.00 as a performance guarantee and will return it to the permittee, minus any penalties imposed, when the permittee fulfills the permit obligations.
2. A pre-entry conference between the Service and the permittee will be held before logging begins.
3. The normal operating season for logging is July 1-November 15; Service approval is necessary to log outside these dates.
4. Logging must be completed by November \_\_\_\_\_, unless an extension of contract time is given. Extensions will be considered for periods of time lost due to wet ground conditions, etc., exceeding 7 consecutive days during the normal operating season. Extensions must be requested in writing by the permittee within 30 days of the lost time, and before the termination date of this permit. Extensions will not be considered if the permittee has not completed logging at least 50% of the sale acreage by November \_\_\_\_\_, the first year of the timber sale contract.
5. The permittee will be responsible for routinely maintaining the access route with a motorgrader during the sale.
6. All trees to be cut are designated with two blue paint marks – one at eye level and one near the ground. All marked trees will be cut, regardless of merchantability; exceptions to this, for safety or other considerations, require Service approval. Only marked trees will be cut; double-stumpage penalties will be assessed for unmarked trees cut, and removal of such trees will be done only with Service approval.
7. No loading sets will be allowed in designated patchcuts. The Service must approve locations for all loading sets and haul roads. The size and number of loading sets, and the number of haul roads, will be kept to a minimum. Existing haul roads will be used when possible. Service approval is also necessary for any dozing of soil or grubbing of trees. Additional trees required to be removed for loading sets or haul roads will be marked by the Service and will be charged for at the stipulated stumpage rates.
8. Maximum stump height is 12 inches for trees 14.0 inches DBH and up, 6 inches for trees 6.0-13.9 inches DBH, and as near ground level as possible for trees less than 6.0 inches DBH. A reasonable allowance will be made for flare- or swell-butted trees.
9. Skidding and felling will be carried out so as to minimize damage to the residual stand. Tree-length skidding (with the crowns removed from the log before skidding) is allowed only if skidding damage to residual trees remains minimal. Negligent damage to unmarked trees will be assessed at double the stipulated stumpage rates. The Service Representative will determine assessment of damage to residual trees.
10. Stumpage rates for additional timber marked, trees damaged, or unmarked trees cut shall be determined by agreement between the permittee and the Service prior to

logging, and will be set for three categories -- red oak sawtimber, other sawtimber, and pulpwood.

11. Trees and tops cut shall not be left hanging or supported by any other living or dead tree or brush, and shall be pulled down immediately after felling.
12. Refuge roads, designated ATV trails, and ditches will be kept free of slash. Slash will also be kept out of sloughs or drainages where normal water flow may be obstructed.
13. Haul roads and skid trails will be kept free of ruts. The permittee will restore haul roads and skid trails to a level condition with the surrounding topography so as not to impede the natural hydrology or create areas of standing water. The permittee shall provide and install any necessary culverts in the sale area, and shall construct limited distances of board roads, as needed.
14. The permittee will complete logging operations in one area of the sale, normally not to exceed the area serviced by one loading set, before beginning in another area.
15. Should logging operations expose any archaeological or historic resources, the permittee will immediately cease operations in that area and notify the Service.
16. The permittee shall pay the United States of America for any unnecessary damage resulting from the operations herein permitted, and shall repair all damages to roads, trails, ditches, and other improvements.
17. The permittee will do all in his power to prevent and suppress forest fires, and will be held liable for damages and suppression costs resulting from permittee-caused fires, except as may otherwise be allowed under State or Federal laws. During periods of extreme fire danger, the Service may temporarily halt logging operations.
18. If storage facilities for oil or gas products are maintained by the permittee in the sale area, the permittee will ensure that the facilities meet all EPA and USFWS standards and take appropriate preventive measures to insure that any spill of such oil or gas products does not enter any stream or other waters, and will report any such spill to the Service.
19. The permittee will follow all refuge regulations. No littering is allowed.
20. The decision of the Regional Director, U.S. Fish and Wildlife Service, shall be final in the interpretation of the regulations and provisions governing the sale, cutting, and removal of the timber covered by this permit.

**Attachment 4 Tables of Volume and Numbers of Stems, Timber Sale \_\_\_\_**

## **Attachment 5. Certificate of Independent Price Determination**

### **U.S. DEPARTMENT OF THE INTERIOR Fish and Wildlife Service**

#### **CERTIFICATE OF INDEPENDENT PRICE DETERMINATION (101-45.4926 Fed. Prop. Mgt. Reg.)**

- (a) By submission of this bid proposal, each bidder or offerer certifies, and in the case of a joint bid or proposal each party thereto certifies as to its own organization, that is in connection with this sale:
- (1) The prices in this bid proposal have been arrived at independently, without consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices, with any other bidder or offeror or with any competitor;
  - (2) Unless otherwise required by law, the prices which have been quoted in this bid or proposal have not been knowingly disclosed by the bidder or offeror and will not knowingly be disclosed by the bidder or offeror prior to opening, in the case of a bid, or prior to award, in the case of a proposal, directly or indirectly to any other bidder or offeror or to any competitor; and
  - (3) No attempt has been made or will be made by the bidder or offeror to induce any other person or firm to submit or not to submit a bid or proposal for the purpose of restricting competition.
- (b) Each person signing this bid or proposal certifies that:
- (1) He is the person in the bidder=s or offeror=s organization responsible within that organization for the decision as to the prices being bid or offered herein and that he has not participated, and will not participate, in any action contrary to (a) (1) through (a) (3), above; or
  - (2) (i) He is not the person in the bidder=s or offeror=s organization responsible within that organization for the decision as to the prices being bid or offered herein but that he has been authorized in writing to act as agent for the persons responsible for such decision in certifying that such persons have not participated, and will not participate, in any action contrary to (a) (1) through (a) (3), above, and as their agent does hereby so certify; and  
(ii) He has not participated, and will not participate, in any action contrary to (a) (1) through (a) (3), above.
- (c) This certification is not applicable to a foreign bidder or offeror submitting a bid or proposal for a contract, which requires performance or delivery outside the United States, its possessions, and Puerto Rico.

- (d) A bid or proposal will not be considered for award where (a) (1), (a) (3), or (b), above, has been deleted or modified. Where (a) (2), above, has been deleted or modified, the bid or proposal will not be considered for award unless the bidder or offeror furnishes with the bid or proposal a signed statement which sets forth in detail the circumstance of the disclosure and the head of the agency, or his designee, determines that such disclosure was not made for the purpose of restricting competition.

## **Attachment 6. Equal Employment Opportunity Clause**

"During the performance of this contract, the contractor agrees as follows:

- "(1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.
- "(2) The contractor will, in all solicitations or advancements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex or national origin.
- "(3) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency contracting officer, advising the labor union or workers' representative of the contractor's commitments under Section 202 of Executive Order No. 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
- "(4) The contractor will comply with all provisions of Executive Order No. 11246 of Sept. 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.
- "(5) The contractor will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.
- "(6) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be cancelled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order No. 11246 of Sept. 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.



"(7) The contractor will include the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order No. 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as may be directed by the Secretary of Labor as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, that in the event the contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, the contractor may request the United States to enter into such litigation to protect the interests of the United States." [Sec. 202 amended by EO 11375 of Oct. 13, 1967, 32 FR 14303, 3 CFR, 1966-1970 Comp., p. 684, EO 12086 of Oct. 5, 1978, 43 FR 46501, 3 CFR, 1978 Comp., p. 230]

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